JOURNAL

OF THE

# Department of Agriculture

OF

WESTERN AUSTRALIA.

Vol. 10. (Second Series) JUNE, 1933. No. 2.

## THE PREPARATION OF THE FARMER'S CLIP.

By Hugh McCallum—Sheep and Wool Inspector,
and W. McC. Johnson—Cadet.

So many articles have been written by representatives of all sections of the woollen industry amply proving the financial soundness of expending labour on classing, or, if necessary, money for the payment of a professional classer in order that a well-prepared clip may be forwarded for sale, that it is almost unnecessary to devote space to a preliminary discussion of the economical aspects of classing. May we, however, remind our readers that many of these articles, including several prepared by one of the writers, were published during the period following the Great War, when wool-growers were disposing of their product at highly remunerative prices. If it was then considered by those who were interested in the welfare of the industry, that the operation of classing was of such importance to growers that they should persistently urge them to pay more attention to it, surely it is imperative that sheep farmers to-day, when ruling prices leave little, if any, margin of profit, should perform this operation with meticulous care.

This article has been prepared with a view to assisting in the preparation of their clips, those wool-growers who depasture flocks of less than 2,000 sheep, for such a flock will not produce a wool clip sufficiently large to warrant the engagement of a professional classer. It will deal briefly, but clearly with the scope, with all the operations involved in the preparation of the clip, with the single exception of shearing. This is usually made the work of an expert, but in order to assist farmers who do not engage such experts, the "Shearing of Sheep" has been made the subject of a separate article which will be forwarded for publication in the next issue of this Journal.

### *Preparation.*

Before shearing is commenced, careful preparation must be made. All machinery should be thoroughly overhauled in order to ensure that it is in perfect running order.

The shearing board should be washed and then continually swept while shearing is in progress. Tables and wool bins and baskets should be carefully cleaned and placed in position or else temporary bins should be erected in order to facilitate the work of classing. Finally, it is advisable, where possible, to keep the yards watered during shearing in order to prevent dust from rising and becoming incorporated in the fleece.

*Picking up and Throwing.*

When the shearer commences his work, he will first remove the belly wool. This should immediately be picked up and placed in its allotted basket. In the case of a wether, the part of the wool stained by urine should be removed and placed in a basket reserved for stained pieces, as this stain is permanent, that is to say, it cannot be removed by ordinary methods of scouring. When the rest of the fleece is removed, it will lie on the floor, with the newly clipped or flesh end of the staple upwards. The "picker up" should stand with his feet under the neck portion of the fleece, then stoop over and grip firmly the britches, or wool from each hind quarter, and draw it round the rest of the fleece. The fleece will then be carried to the table and spread out by throwing the arms forward over the table, allowing the neck portion to go first and retaining the grip of the britch portions of the fleece until it is entirely spread out. This reverses the fleece, turning the outside or tip of the staple upwards. These operations of picking-up and throwing are very important links, and if they are skilfully performed, will enable the skirting to be carried out in a more satisfactory manner.

In the case of lambs, the wool should be gathered from the floor between two light boards, about 18 inches long by five inches wide.

*Skirting.*

The fleece is now in position for the very important operation of skirting. As it is so important, it is unfortunate that no definite rules can be set down regarding its performance, for it is governed largely by the vagaries of the season and the quality of the fleece. The object of skirting is, of course, to remove all portions of the fleece which differ from the main part. Such differences may be of quality, length of staple, colour, soundness or condition. The portions of the fleece which exhibit these differences will probably be the wool from the arm pits, which will be short-stapled and sweaty ; the wool from the flanks, which will be discoloured ; the cheek wools, which will be short stapled ; the neck folds, which will be rough and matted ; and the short hairy breeches. Under some seasonal conditions, sheep pastured in the agricultural and pastoral districts of the State will carry in the back wool a great deal of dust and sand. Under such circumstances, this portion of the fleece should be removed with the rest of the skirtings. Again, in some districts in all seasons, and in practically all districts in some seasons, the outer portions of the fleece will contain seed or burr. When this is so, it should be skirted more heavily, that is more deeply, into the body of the fleece. When this work has been skilfully performed the fleece wool, which remains, will be clean and of an even length of staple.

*Rolling.*

The fleece must now be rolled so that it may be conveniently placed in the bin to which it belongs, where it will await baling. There is now one method commonly adopted of so treating the fleece. One side of the fleece is folded over for a margin of one-third of its width. The folded portion is then turned right over to the further edge of the fleece. This leaves it in three layers with the back wool showing on top. The fleece should now be rolled from tail to neck. By this means the back wool, which is the least attractive portion of the skirted fleece, is rolled in the centre and the shoulder wool, which is the most attractive, is finally left exposed.

*Classing.*

It is necessary to class wool so that buyers may be given an opportunity of purchasing the lines in which they specialise, for some manufacturers buy fleece wool only, while others concentrate on pieces, bellies, lambs, etc.

This is generally recognised. One can see, however, from an inspection of the clips displayed for sale on the Show floor that many growers have not yet realised

the immense importance of separating wools of different lengths of staple, quality, soundness, colour and condition.

It must, of course, be understood that rules concerning the division of such wools will be applied more or less rigorously according to the size of the clip. For instance, a farmer with a clip of 25 bales could not separate so deliberately wool of different length of staple, quality, etc., as one with a clip of say 200 bales, or he would be hopelessly overclassing his wool, which is almost as undesirable as underclassing. He must learn, therefore, to make his lines as even as possible, whilst keeping them of reasonable size.

Let us, therefore, consider a farmer with less than 2,000 sheep. It will be possible, in classing the clip, to separate the strong wools from the medium and fine. The size of the clip, however, will not permit of the separation of wools of similar quality which do not differ greatly in length of staple. The few fleeces, and they should be few if the flock is carefully culled, which are very short in the staple could be placed in the caste line. This is not, under modern manufacturing conditions, a very serious matter, for improved machinery has modified the requirements of such different sections of the trade as Combers and Carders, who could once only buy wools of specific length.

"Tender" fleeces must be kept out of the sound lines and placed in the caste lines, or if there are many—as there may be under some seasonal conditions—placed in a separate line and branded "Fleece." Finally, the black-tipped and heavy fatty fleeces must be separated from these light to medium-conditioned lines. The importance of this cannot be over-emphasised. One frequently sees say three bales, representative of a line opened up on the Show floor apparently very attractive and even in condition ; when a buyer in trying to estimate the yield of the wool discovers deep down in a bale one heavy conditioned fleece. This may be the only one in the line, but it destroys the buyer's confidence in the clip and he will be very conservative in his estimate of its yield. This may mean pence per pound to the vendor.

*Classing.*

The following are the lines into which such a clip would probably be divided, with a description of the wools to be found therein :—

*Fleece Wool—*

| | |
|---|---|
| AA | Sound, good length, light condition 64's and upwards. |
| A | Sound, shorter, heavier 64's and upwards. |
| BB | Sound, good length light to medium condition 60's. |
| B | Sound, shorter, heavier 60's. |
| C | Short, fatty or tender. |

(In some seasons, the number of tender fleeces may necessitate the making of a separate line branded "Flc." or even of two lines :—

A Flc.—the finer tender fleeces.
B Flc.—The broader tender fleeces.

*Skirtings—*

| | |
|---|---|
| A Pcs. | The longest, lightest and freest pieces. |
| Pcs. | Shorter and heavier. |
| Bls. | Probably one line of bellies minus stains. |
| Bks. | The earthy backs previously referred to. |
| Std. Pcs. | One line minus dags. |
| Lks. | One line minus dags. |

It is a very bad policy to allow dags and fribby ends to be included in a bale of locks or stained pieces as the buyers do not pay for these, while the freight must be paid.

*Lambs—*

A lbs. Longest and light to medium conditioned 64's/60's.
lbs. Shorter and heavier 64's/60's.

*Baling and Pressing.*

It is impossible to bale wool neatly without the use of a press of some description. There are, on the market, several types of presses which have been designed to meet farmers' requirements and can be purchased very cheaply. However, there have been serviceable presses constructed on a farm from directions and diagrams which have appeared in the press and various publications. If a woolgrower does not possess a press and wishes to avoid the expense of purchasing one, he may obtain full constructional details from this Branch of the Department.

Packages of fleece or skirtings cannot be offered by auction as a bale of wool unless they weigh 201 lbs. gross, or in the case of lambs' wool, 151 lbs. gross. Any package below those weights is considered a light weight and has to be sold separately as such. When baling, it is desirable that the packing should be adjusted so as to eliminate light weights, but a mixed bale must not be made under any circumstances. It is far better to pack oddments in bags.

*Branding.*

The bale must now be branded. This operation was discussed in detail in the last issue of the Journal, but for the benefit of new readers and the sake of completeness, we shall include a brief summary of the directions given. The bale should be branded, using a stencil and reliable black ink on the sewn or hooked cap and on the front of the wool pack with the name of the holding, the abbreviations describing the contents and the number of the bale. Growers must on no account place any mark on the bottom of the bale, as this is reserved entirely for the buyer's countermark or port of destination.

These operations of pressing, baling and branding are very important, as the buyer obtains his first impressions of the clip from the appearance of the bales, and if they are neatly pressed and correctly branded they will inspire confidence in him.

We are conscious, of course, that this brief outline of the operations involved in the preparation of a clip would be much more valuable if it were illustrated by plates, depicting the various steps, but, unfortunately, these were not available. We would, however, refer our readers to the Departmental Bulletin, No. 60, which —although issued before the new methods of classing and branding were drawn up by representatives of the Selling Brokers and Wool Buyers, contains much valuable and more detailed information and in addition is very clearly illustrated.

It has been said that one effect of the depression prices for wool has been to stimulate interest in effective classing. If this is so, it at least is something for which we can be thankful. At any rate, whatever the cause may be, the "get up" of the Western Australian clip has certainly been greatly improved during the last few years, and it is very gratifying to hear of the praise which Mr. deLatour, the President of the Wool-buyers' Association, in his review of the selling season recently completed, bestowed on the classing of our clip. At the same time it is realised that there is still much room for improvement in the "get up" of many of our smaller clips, and it was, therefore, considered worth while to direct the attention of these growers to this phase of their work so that, when prices recover, they will, with the larger growers, reap the maximum reward.

# THE REARING OF DAIRY CALVES.

L. C. Snook, B.Sc. (Agric.), Agricultural Adviser, Dairy Branch.

In order to accelerate the rate of improvement in productivity of the average dairy cow, the Department is actively advocating a policy embracing grade and pure bred herd recording, and the use of pure bred bulls ex tested dams. Herd recording enables the farmer to discover the high producing cows, and the use of a bred-for-production bull should ensure that the progeny of these cows are at least as productive as their dams. If full benefit is to be derived from these well nigh essential practices, it is necessary that a draft of healthy heifer calves be raised each year.

It is hoped that the following outline of the fundamental principles involved in the rearing of calves will prove of interest and value.

The article, for convenience, has been divided into three sections:—

1. Feeding, where separated milk is available.
2. The use of milk substitutes.
3. General management.

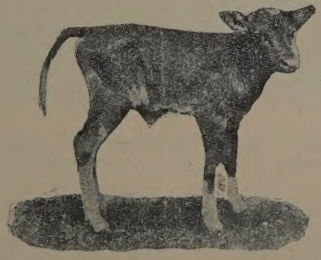
## CALVES REARED ON SEPARATED MILK.

### *Time to separate Calf from Dam.*

Most dairy calves are taken away from their mothers within a week of birth and are reared on milk fed per medium of the bucket. Opinions differ regarding just when to separate the calf from its dam. Some breeders take the calf away almost as soon as it is born, reasoning that this prevents growth of affection. The most common practice, however, is to leave the pair together for one or even two days. This has many advantages—the delicate calf receives its natural food at short intervals, and the sucking and massaging of the udder does much to reduce inflammation and to sooth the cow. It certainly seems wise to delay separation for at least 24 hours.

### *Calf must obtain Colostrum.*

The calf always should receive its mother's milk for at least seven days. The first milk or colostrum is specially constituted to act as a purgative and also plays



The delicate age (first four weeks).

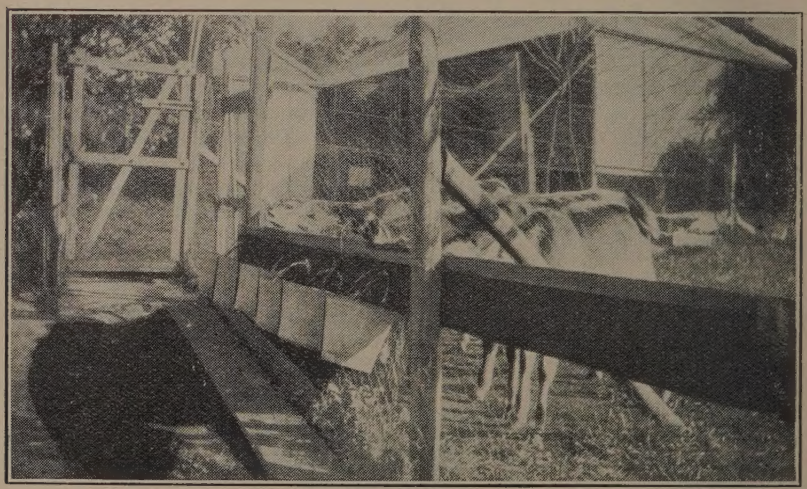
an important part in making the calf resistant to scours and similar infectious diseases. If the dam of a valuable calf dies soon after calving, an endeavour should be made to obtain some colostrum from another newly-calved cow.

*Teaching the Calf to Drink.*

Much difficulty often is experienced in training the calf to drink milk out of a bucket. This task is rendered much easeir by first allowing the calf to become properly hungry. Leave it without food for about 12 hours. If a hungry calf is allowed to suck the fingers dipped in the milk, it will soon learn to suck up the fluid. It should be taught to drink unassisted as soon as possible. One often sees quite large calves which will not drink without having a finger to suck. Such individual attention is an unnecessary waste of time.

*Rubber Feeding Tubes.*

Some breeders use rubber feeding tubes, through which the calves suck the milk from a bucket. It is claimed that the milk is thus obtained in a natural way, and is well mixed with saliva instead of being hurriedly gulped down. This argument appears very sound, and experiments which have been conducted indicate that calves reared with the aid of these rubber feeders are more thrifty and robust than their fellows fed directly from a bucket. These tubes cost about 3s. each (dozen lots), and last for several years if well cared for. It is imperative that these tubes should be kept scrupulously clean. Their use results in a saving of time.



An easy way of feeding Milk to Calves.
Use of Feeding Tubes at Mr. A. J. B. Strempel's Farm, Greenmount.

*Should a Calf be fed three times a day?*

Feeding three times a day probably gives somewhat better results with young calves, but it is very doubtful whether the extra trouble is warranted. If care is taken not to overfeed, twice a day feeding should prove effective. Care should be taken to feed the milk at as near blood heat as possible (98 to 100 deg. Fah.), or digestive troubles will occur, manifested generally by diarrhoea.

*Quantities of Milk required by Calves.*

Over-feeding is the most common mistake made in rearing calves. During the first week of its existence, a calf only requires 6 to 9 lbs. of its mother's milk per day. No benefit will result from feeding more than 9 lbs. The milk should be weighed occasionally to check the quantities being given. Three or four pounds of milk may not appear much to last a calf for half a day, but it is all that is required at this stage.

During the second week the allowance may be increased to from 9 to 11 lbs. of whole milk per day.

*Use of Separated Milk.*

Butterfat is valuable, and whole milk can be replaced gradually by separated milk after the second week. Some breeders prefer to rear promising calves almost entirely on whole milk. This practice is expensive as, although a calf fed on whole milk may appear somewhat sleeker and more attractive while young, experience has shown that, provided ample skim milk is available, such calves as yearlings are very little, if at all, superior in dairy development to others reared on separated milk.

*Value of Separated Milk.*

Skim milk is an extremely valuable food, as the act of separation removes only fat, which is used by the animal almost entirely as a source of heat or energy. All the body-building materials which make whole milk so complete a food for young growing animals still remain in the skim milk. If an easily digested energy providing food such as cereal grain is available as a supplement, whole milk may be replaced by separated milk without any check resulting to the calf.

The following table showing results obtained in an experiment on the feeding of calves, conducted at Woburn in England, illustrates this point:—

TABLE 1.

| Group. | Food. | Gain per Calf per week. | Cost per lb. gain in Live-weight. |
|---|---|---|---|
| | | lb. | pence. |
| Lot 5 | Separated Milk plus Crushed Oats fed dry ... | 13·30 | 2·52 |
| Lot 4 | Whole Milk ... ... ... ... ... | 12·83 | 5·39 |
| Lot 2 | Purchased Calf Meal in Separated Milk ... | 8·66 | 2·77 |
| Lot 3 | Gruel (Linseed and Oatmeal) in Separated Milk | 8·33 | 3·45 |

All calves received whole milk for the first three weeks.

*Changing to Separated Milk.*

Whole milk may be gradually substituted by skim milk during the third week, taking about a week to complete the change.

Concurrently with the addition of separated milk, a grain supplement, preferably crushed oats, should be fed. Where the calves have access to good green pasture, very little grain is required, as calves soon learn to nibble at available roughage.

*Feeding Grain Supplements.*

The best method to feed grain supplements is as a dry meal. Begin by placing a little dry meal in the bottom of the bucket after the milk has been consumed. A taste for the meal will soon be acquired.

The feeding of meals as a gruel is not recommended, as trials show that grain meals so fed are not so well digested as when fed dry. (See Table I.) With dry feeding the calf has to eat slowly; the food is well chewed, and is thoroughly mixed with saliva before being swallowed. A gruel is swallowed quickly without any preliminary mastication. The feeding of a dry meal immediately after the milk ration does much to eliminate the desire to suck each other, and calves are easier to wean than when gruel fed.

*Grain Meals to use with Skim Milk.*

In preparing a supplement to use along with skim milk, it should be remembered that an easily digested starchy food is required. Skim milk is very rich in protein—the albuminoid ratio is 1 : 1½, as compared with whole milk 1 : 4. The practice of adding protein rich foods to skim milk for feeding young calves is expensive and dangerous, often resulting in serious digestive derangements. The best supplements consist of crushed cereal grains, crushed oats being a very popular constituent. Wheat bran adds greatly to the palatability of a ration, and is much used for this reason.

Commonly used supplements which may be recommended are:—

1. Crushed oaten grain.
2. Equal parts of crushed oats and wheaten bran.
3. Equal parts of crushed oats and crushed wheat.
4. Nine parts crushed oats, three parts crushed wheat, and one part linseed meal.

Linseed meal is sometimes used in small quantities, as it is much relished by calves and encourages them to eat the meal in the early stages of feeding. Linseed meal also has a tonic effect on the system and adds "bloom" to the appearance of animals receiving no green fodder. However, linseed meal should not constitute a major part of a skim milk supplement.

*Gruels.*

If it is desired to feed the supplement as a gruel, pollard may be recommended, using about half a pound per gallon of skim milk. Make into a porridge with hot water and then mix thoroughly with the milk

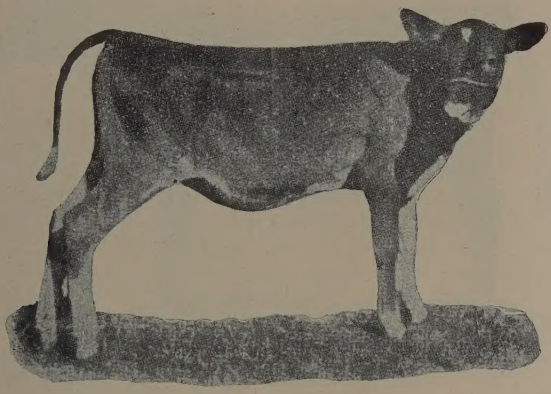
Pollard has a somewhat costive action, but this may merely counteract the tendency of skim milk to induce scours.

*Allowance of Grain required.*

During the third week a calf will only consume about a handful of grain. At five weeks about half a pound will be required. Subsequent increases will depend on the quality of the roughage available. It is rare that more than 2 lb. per day will be required up to the age of three months. Where calves have access to good green pasture and have ample skim milk, very little grain will be required. In the absence of green roughage, good hay should be made available, and, as the calf develops, the grain ration should be mixed with good quality chaff.

*Management.*

Calves always should be tied up or, preferably, be kept in calf bails during feeding. This is especially important when grain supplements are being used. Each calf should be able to eat its allotted share at leisure, without fear of being molested by its larger fellows. No definite table of weights of milk and grain to be given at specific ages can be supplied. This must be left to the judgment of the



The skim-milk age (one to six months).

feeder, who should study the individual requirements of his charges. However, the general plan to be followed in rearing a calf on skim milk is outlined hereunder:—

1st-2nd day.—Leave with dam, which should be relieved of surplus milk.

3rd-14th day.—Feed dam's milk at blood heat (98-100deg. Fah.). About 6 to 9 lb. per 24 hours is sufficient.

3rd-4th week.—Gradually substitute skim milk for whole milk. Commence grain supplement, using about a handful per day at first. Give access to good pasture if possible. Increase skim milk ration to about 13 lb. per day at end of 4th week.

5th week onwards.—If available, increase skim milk ration by about 2 lb. per week until 20 lb. per day is being given. The grain ration may be increased from ½ lb. per day at five weeks to 2 lb. per day at nine weeks. If pasture is not available, fresh meadow hay should be placed in accessible racks, and increasing quantities of chaff should be mixed with the grain ration. Where ample good pasture and skim milk are obtainable, little or no grain is required after the fifth week.

Always supply ample fresh water to calves at all ages.

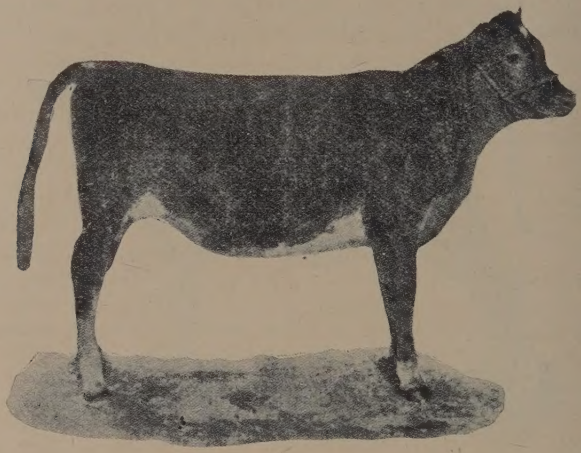
A calf should increase in live weight at the average rate of almost a pound per day during the first three months.

*Weaning.*

The time to wean will be determined by the amount of skim milk available. Benefit will be derived from skim milk up to seven months of age, but it is more common to wean at about five months old. Avoid weaning calves suddenly; give them a chance to learn to obtain their requirements elsewhere.

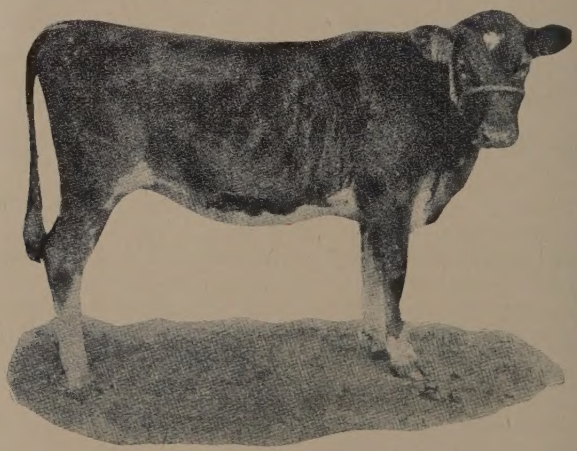
*After Weaning.*

This is generally the most trying period in the life of heifers. The rate of growth must be maintained by keeping them on good pasture; if green feed is not available, good hay should be supplied.



The oft-neglected age (six to 15 months).

Legumes (green and as hay) are of great value to calves after weaning, being rich in the proteins and mineral matter required by growing animals.



The breeding age (15 to 22 months).

On dry feed all stock should receive some suitable phosphatic lick to counteract the almost certain deficiency of phosphoric acid in such fodder.

Do not mate heifers too young. The best breeding age is between 15 and 20 months.

*The Use of Milk Substitutes.*

Dairymen who sell whole milk are handicapped in rearing calves insofar as no separated milk is available. Still it is desirable that the heifer calves from the top cows be reared to improve and maintain the herd, and this can be effected by the use of whole milk substitutes.

The calf should be fed for about two weeks on whole milk from its mother. This will occasion very little loss, as the colostrum or first milk is unfit for sale. During the third week, gradually replace the whole milk by a gruel so that at four weeks no whole milk is being fed. Various gruels may be used. Proprietary calf foods are often quite good, but it is generally cheaper to use a home-made mixture. Encourage the consumption of dry meals as soon as possible.

*Substitutes for Milk.*

When no skim milk is available, a gruel made from the following mixture serves as a good substitute. Mix three parts by weight of pollard with two parts of linseed meal. Use 3 lb. of this mixture to a gallon of water. Feed in the same quantities as directed for separated milk (page 66). Some dairymen prefer to use a higher proportion of linseed meal, but the ratio recommended should prove satisfactory.

Numerous other more or less complex mixtures of various grains and meals have been recommended, but the one given above seems the simplest and most suitable for Western Australian conditions. Where leguminous grains, such as peas or beans, can be obtained and crushed, these should be incorporated in the calf meal. Results have been quoted from New Zealand experiments, in which calves reared on bean meal grew even better than others fed on skim milk and cereal grains. The following mixture illustrates how peas (or beans) may be incorporated in a mixture:—

| | |
|---|---|
| Linseed meal—2 parts<br>Crushed peas—1 part<br>Pollard—2 parts | 2½ lb. per gallon of water fed as a gruel in the same quantities as recommended for separated milk on page 66. |

*Use of Dry Meals.*

As soon as possible substitute "dry" feeding for the much more troublesome gruels. The methods used are essentially the same as described for calves fed on separated milk. During the third or fourth week, commence placing a little dry meal in the bottom of the calf's bucket after the gruel has been consumed. As the taste for the concentrate is acquired, increase the ration and feed proportionately less meal in the liquid form. It is better to dilute the gruel than to decrease the bulk supplied, as calves should be encouraged to drink ample water. Readily accessible supplies of fresh water always should be available to young calves.

*Dry Meals to replace Separated Milk.*

The meal here required is quite different from that fed to calves receiving ample separated milk. The proteins and mineral matter normally obtained in milk must be supplied in the supplements. A simple and very efficient mixture ("A") consists of equal parts of crushed oats and linseed meal. This approximates to the required albuminoid ration 1 : 4 and, when fed in conjunction with leguminous hays or young green pasture, should satisfy the needs of the growing animal.

A second mixture which can be recommended is:—

"B" Linseed meal—1 part by weight.
Crushed oats—1 part by weight.
Wheat bran—1 part by weight.

This mixture may prove cheaper, as less linseed meal is required, and may be more suitable than mixture "A" for very young calves, especially if the oats used are fibrous. If the oats have to be purchased, mixture "B" is recommended.

If crushed peas or beans are available, a well balanced meal may be prepared as follows:—

"C." Bran—3 parts by weight.
Peas—2 parts by weight.
Crushed Oats—2 parts by weight.

This may not prove so palatable as a mixture containing linseed meal, and could be improved by the addition of some of this concentrate.

The choice of a meal is determined by the relative cost of the various constituents and the nature of the roughage available. Good mixed pasture simplifies the problem, as it supplies most of the requirements of a young calf. Conversely, in the Wheat Belt, calves receiving only dry cereal roughage (say wheaten and oaten hay) will need a supplement rich in mineral matter. Bran or crushed wheat will supply ample phosphorus, but an additional source of lime will be needed. In the absence of leguminous roughages (which are rich in lime) it will be necessary to add 4 to 5 per cent. of ground limestone or slaked quicklime to the grain supplement.

During the period when whole milk is being reduced, the calves may show an appreciable loss of bloom, but, if a good meal is used, little check in the rate of growth will be noticed. Calves on milk substitutes may appear to lose ground during the fourth to seventh week when compared with those receiving separated or whole milk, but at the age of six months very little difference will be discernible.

## GENERAL MANAGEMENT.

Having considered the problem of feeding, it is now necessary to refer to other factors of importance.

*Cleanliness* is essential. Calves must be kept in clean quarters and fed clean foods. Scours—a dreaded scourge of calves—is due almost invariably to faulty hygiene. The use of dirty buckets, unclean or stale milk, or soiled roughage, results in the distribution of disease germs among the pens. As scours may be contagious, infected animals should be isolated and the particular pen disinfected.

Digestive disorders also result from over-feeding, and feeding milk too hot or too cold, irregular feeding, and through exposing the calf to inclement weather.

### *Treatment of Scours.*

When a case of scours occurs, at once reduce the milk fed by about half. In cases of bad attacks no milk at all should be given; merely supply boiled water cooled to blood heat. The restricted food supply will cause weakness, but will have no permanent deleterious effect. As the diarrhoea ceases, milk may be gradually reinstated in the ration. The addition of lime water to a reduced ration of milk is often effective in checking mild attacks of scours.

*Calf Pens.*

The ideal is to have a small pen for each calf, but this is seldom possible. Where a number of calves are running together, the use of calf bails greatly facilitates feeding and may be used to counter the nasty habit—common in calves—of sucking each other. Small bails are easily constructed, rough timber being quite effective.

Calf-feeding bails.

Each calf can here receive its allotted ration, and is detained until the desire to suck has passed away. Where meals or chaff are being fed, always give these immediately after the skim milk. This also helps to check the habit of sucking. If bails are not used, tie the calves up so as each one receives its fair share of food. It is common to see a number of calves of various sizes being fed from the one trough; under such conditions the large animals rob the smaller ones.

*Shelter.*

Calves should not be exposed to cold winds or excessive wet. A dry shed free from draughts and with clean straw for bedding should be provided.

Do not keep calves cramped up in small, badly lighted yards. Sunlight is of great value in killing pathogenic germs and stimulating good health. In summer time sufficient shade should be provided, but undue pampering should be avoided at all times.

*Dehorning.*

The dehorning of grade cattle generally is most desirable. Much suffering and many cases of severe loss result from cows goring each other. These daily feuds are unnecessary, as the horns can be prevented from developing by a simple operation soon after birth.

When the calf is about a week old, smear some vaseline or motor car grease around the small button or embryo horn which can be felt on the head. Do not put vaseline on the horn itself; the vaseline is to protect the surrounding skin. Then take a stick of caustic soda (purchasable from the chemist), moisten the end, and rub on each horn three or four times. Allow the caustic soda to dry between each application. Take care that the caustic is placed only on the horn and does not run or drop elsewhere.

The operation should not be performed in wet weather unless the calf is kept under shelter, as rain may wash the corrosive material from the point of application and endanger the eyes. With a little care, polled cattle can easily be obtained with little expense and practically no pain.

*Steers.*

Castration of male calves which are to be retained as steers should be done as soon as the testicles can be felt in the scrotum. The operation is simple, cleanliness being the main essential, and should be done while the calf is still young.

*Conclusion.*

Calf-raising can be made a very profitable phase of farm life. An owner tends to develop more interest in stock of his own breeding, and it is a source of justifiable pride to be able to say that the best cows in the herd were bred on the property. Breeding good livestock requires much skill and experience, but every owner of a dairy herd should develop such latent talent as he may possess by the use of a bred-for-production bull, and rearing the heifers from the best producers in the herd. By "grading up," a good herd can be evolved in a few years, but healthy calves are just as essential in furthering this object as are high quality breeding stock.

---

## SOWING SUDAN GRASS UNDER IRRIGATION AS A COVER CROP WITH PASPALUM.

H. J. K. GIBSONE and G. GAUNTLETT, B.Sc.

Under irrigation the method of laying down a paspalum pasture in the spring with a cover crop such as Sudan grass, and the subsequent grazing of the latter commends itself, as the cover crop provides green feed for the stock during the dry summer months, while the paspalum is growing.

A noteworthy example of the above method of establishing a paspalum pasture this season in the new Harvey Irrigation Area has been that of Mr. L. Temple, 3rd St.

The following details were obtained from this farmer:—

Ten acres originally heavily timbered with wandoo were subdivided into four 2½-acre paddocks. The soil may be described as a sandy loam with a clay subsoil 6-8 inches from the surface.

The land, which was originally partially cleared and sown with subterranean clover six years ago, was ploughed during the first week in October, disc cultivated twice and then harrowed. During the first week of December it was ploughed into 4½ yard lands and harrowed, and finally rolled after planting the Sudan grass.

Sudan grass at the rate of 6lbs. per acre mixed with 1cwt. of B potato manure, was sown with the drill on December 15th. 6lbs. of paspalum and 1½ lbs. of white clover mixed with 1cwt. of super were sown per acre on December 30th, the seed used being obtained from F. H. Brunnings Pty., Melbourne. A very good germination resulted illustrating the advantage of using good viable seed so important in the establishing of a permanent pasture.

*Watering.*

The crop was watered on December 22nd, 1932 (prior to the planting of paspalum and white clover) and again on January 15th, 1933.

The method used was the ordinary furrow system of irrigation, the water being conveyed from the main channel through a head ditch into the finishing furrows left at the last ploughing, which prior to irrigating were opened out with the plow. The flow of water in the furrows was regulated by means of 4-inch outlet boxes provided with shutters made of tin, enabling the amount of water through each to be easily controlled.

The scheme was laid out according to departmental specifications, the head ditch being made 2ft. wide on the bottom with a batter or side slope of ½ to 1, the top of the banks being 12 inches wide and at least 18 inches above the invert or bottom of the channel, which is approximately 9 inches below the natural surface level, and has a fall of ½in. to the chain. To maintain this grade, it was necessary to put in drops made of sandbags approximately every chain along the channel, owing to the heavy fall in the land.

Grazing was commenced in the first paddock on February 1st (six weeks after planting). 26 cows were turned in for two hours a day at first, and then later for four hours a day. The grazing lasted until February 9th, when a small residue of stalk was mown and given to the dry stock. The paddock was then watered on February 13th and chain harrowed when dry enough.

The other paddocks are receiving similar treatment.

Sudan Grass under Irrigation.

Some idea of the heavy growth of Sudan grass may be gathered from the accompanying photograph. The man in the centre of the picture is over 6ft. in height.

Grazing a tall crop is regarded as a doubtful expedient on account of wastage through trampling, etc. However, providing the crop is suitable and the cows are only left in from 1½ to 2 hours at a time, there should not be much loss, but it is not recommended to allow the crop to become so tall. The crop in question was left ungrazed longer than was anticipated on account of minor

troubles in connection with the watering. The fact that very few stalks were left illustrates the high palatability of Sudan grass.

There is no doubt about the feeding value of Sudan grass. The following table shows the relation between it and Japanese millet, which also does well under irrigation. These analyses taken from crops in the same stage of growth and grown under similar conditions were obtained by the Department of Agriculture, New South Wales:—

| | Sudan Grass. | Japanese Millet. |
|---|---|---|
| Moisture .. .. .. | 51.0 .. | 55.35 |
| Protein .. .. .. | 7.25 .. | 5.95 |
| Fat .. .. .. .. | 1.22 .. | 1.04 |
| Ash .. .. .. .. | 5.16 .. | 6.44 |
| Fibre .. .. .. .. | 14.36 .. | 13.27 |
| Carbohydrate .. .. .. | 20.83 .. | 17.95 |

It is not wise to take anaylses at their face value, but they certainly indicate where conditions are the same, the relative merits of crops.

The value of a fodder crop or permanent pasture is necessarily determined by the increased yield of butter fat from the cows. Since grazing on the Sudan grass, Mr. Temple's cows have shown an increase of 100 per cent. The cows were, however, on dry feed prior to being turned into the Sudan grass. More direct benefit would have resulted if the crop had been planted earlier, say late in October. The cows would then have been on green feed immediately the clover had finished, and more bulk would have resulted from the season's growth. The time of planting is necessarily governed by seasonal and other conditions. It is therefore interesting to compare Mr. Temple's returns with the corresponding month in 1932, before he had irrigation on his holding:—

In February, 1932, without irrigation—22 cows gave 210lbs. butter fats, an average of 9.54lbs. butter fat per cow.

In February, 1933, with irrigation—21 cows gave 378lbs. of butter fat, an average of 18lbs. butter fat per cow.

The following shows the cost of seed and manure per acre of the crop and pasture:—

| | |
|---|---|
| Paspalum, 6lbs. at 1s. 4½d. .. .. | 8s. 3d. per acre |
| Sudan Grass, 6lbs. at 5d. .. .. .. | 2s. 6d. „ |
| White Dutch, 1½lbs. at 2s. 3d. .. .. | 3s. 5d. „ |
| Super, 1cwt. .. .. .. .. | 5s. 0d. „ |
| Potato Manure B, 1cwt. .. .. .. | 8s. 0d. „ |
| Total Cost .. .. .. .. | 27s. 2d. per acre |

Poor results were obtained with the white clover. A fair germination resulted, but the plants only reached the second leaf stage and then died. This was probably due to the heavy growth of Sudan grass shutting out the light and exhaling a great amount of carbon di-oxide in the process of respiration, and so suffocating the more delicate clover plants.

The method recommended in the establishment of pasture other than hardy plants like paspalum, is to sow without a rapid growing cover crop, and Mr. Temple intends to re-sow the white clover next spring.

*Sudan Grass Poisoning.*

As a certain amount of doubt still exists as regards the reputed toxic properties of Sudan grass, it may not be out of place here to quote a few notes from an article by Mr. Murray Jones, the late Chief Veterinary Officer, which appeared in the "Journal" of September, 1925.

In the course of his article, the author stated that—

"The evidence of poisoning is insufficient to warrant the condemnation of such a valuable fodder. It has been recognised that sorghum, to which Sudan grass is allied, does at the heading stage develop a very small amount of a cyanogenetic glucosede which fermentation gives an infinitesimal amount of prussic acid, so small however that it may be grazed at any time without danger.

There are, however, times when there may be a possible slight element of danger with Sudan grass:—

1. When the plant is stunted or slow growing.
2. When the crop is not pure but contains hybrids of Sudan and sorghum.

There is no danger of poisoning—

1. When plants have headed.
2. When cut or wilted before feeding.
3. When made into hay or ensilage.
4. When the crop makes rapid growth.

When stock are injudiciously turned on to succulent Sudan grass, trouble is to be expected not through prussic acid poisoning but through digestive troubles. Many of the deaths reputed to be caused by prussic acid poisoning have unquestionably been caused through digestive or mechanical troubles."

*Summary.*

In sowing Sudan grass under irrigation with or without a pasture plant, the following facts present themselves:—

1. Prepare a good firm seed bed.
2. Use good clean seed.
3. Do not sow too heavily; 8 to 10 lbs. per acre is plenty, if drilled. A heavier sowing is more expensive and the plants have not the same chance of stooling.
4. In addition to super, on soil deficient in humus, sulphate of ammonia would be beneficial.
5. Do not sow too late. More green feed is obtained per season when planted earlier, providing the land is warm enough at time of sowing to maintain normal growth.
6. It is advisable to graze the crop early, certainly before it is in flower. This causes the plants to stool more rapidly.
7. The stock should only be grazed for short intervals, say 1½ to 2 hours, otherwise digestive troubles such as hoven or bloat result.

*Watering.*—The following points are important:—

1. The head ditches should be well made according to departmental advice. A well made head ditch enables the farmer to control the water, and thus prevent wastage and over watering.
2. It is advisable to use outlet boxes. This also simplifies the control of the water.
3. Narrow lands, 4½ yards wide, are recommended.
4. Do not over irrigate. Wastage of water and over irrigation cannot be too strongly condemned.

# SEEDS AND SEEDING.

G. R. W. MEADLY, B.Sc., Agricultural Adviser.

Seeds of all kinds, including agricultural, vegetable and flower seeds, are often a cause of considerable worry to purchasers. On occasions when poor germination and weak seedlings are obtained, there is a tendency to immediately condemn the seed as being of inferior quality. Although this may often be the case, there are a number of other factors which influence the germination and subsequent growth.

The awakening of a seed to produce a plant is dependent upon a combination of three external factors, viz., warmth, moisture, and oxygen. Each one of these may be described as a limiting factor, for the presence of any two to the exclusion of the third, will produce little or no germination.

## TEMPERATURE.

The best or optimum temperature for germination varies considerably for different species, being more variable than any other factor. Those who have had practical farming or gardening experience have observed the different temperature requirements for good germination of seeds, and arrange their times of planting accordingly. Thus wheat and oats, which have a low temperature requirement, may be planted when the soil is comparatively cold, but in the case of maize and melons, which have a high temperature requirement, for good results planting should be carried out when the soil is warm. If maize is sown during the winter the seeds will usually decay and have to be replanted. As examples, the optimum germination temperature ranges for oats and maize are 77deg.-88deg. F. and 99deg.-111deg. F. respectively.

## MOISTURE.

The amount of moisture required may be regarded generally as that which will completely saturate and soften the seeds. An important exception met with locally is in the case of the so-called "hard seeds" of a number of our agricultural seeds, particularly Drooping Flowered Clover, Cluster Clover and Lupins. Many seeds of these species have coats which are not immediately permeable, *i.e.*, do not absorb water even when it is present in optimum quantity. They germinate at intervals, some remaining "hard" for years but still retaining their ability to produce normal plants.

An excess of water is as serious and sometimes more so than a deficiency. In soils which are badly drained, the water-table may reach the surface of the ground, thus eliminating the soil atmosphere which is so essential to germination and growth.

A comparatively large amount of water is absorbed by seeds when they germinate, sometimes exceeding the dry weight of the seeds themselves. The variation of specific cases is again large for 100 lbs. of maize after being soaked for germination may weigh 144 lbs., whereas 100 lbs. of White Clover seed after soaking may weigh 226 lbs.

## OXYGEN.

Although seeds are experiencing their optimum temperature and are properly supplied with moisture, only in very few cases will germination occur unless oxygen is available. Normal air contains about one-fifth oxygen so that the supply is ob-

tained by allowing access of air to the seed. In the field, sufficient air may be prevented from reaching the seeds by planting too deeply, or again by sowing in completely water-saturated soils which do not allow circulation of air.

## RELATION OF FACTORS TO FIELD CONDITIONS.

### (a) *Control of Temperature.*

When planting seed in quantity, the grower is largely in the hands of Nature where temperatures are concerned. Certain practices may be carried out, however, to improve the conditions. During the colder months planting on sunny hill-sides will increase the rate of germination and ensuing growth, and good drainage will also raise the average soil temperature.

### (b) *Conservation of Moisture.*

Soil moisture may be conserved by fallowing and cultivating, thus producing a loose surface layer of comparatively fine tilth which protects the underlying soil from excessive evaporation. Mulching with stable manure, dead leaves, spent tannin bark, etc., considerably reduces water evaporation from the soil and may be employed in gardens and small plots during the drier months. Weed control also increases the amount of water available for crop plants for, during the summer in particular, loss of soil water from a paddock due to the presence of a large number of weeds is astounding.

### (c) *Improving Aeration.*

Fallowing and cultivating also loosen and break up the soil, thus assisting the movement of air among soil particles and providing the necessary oxygen for germination and growth. Pastures, particularly those containing Paspalum, from time to time lose their growth vigour which is reinstated by a system of renovation. The pasture is ploughed, thus breaking the matted root system and providing aeration for the underground portions of the plants.

Lawns, particularly those used for games, such as tennis and bowls, become consolidated with the constant play and rolling to which they are subjected. Unless these are forked at intervals to assist aeration, the grass loses its green colour and tends to die out. Lawns may be classed as specialised permanent pastures and behave in a similar manner.

Farmers themselves sometimes actually induce adverse conditions by sowing too thickly. This applies particularly in the case of small seeded plants such as tobacco. When young seedlings are massed together there is a considerable amount of competition for light, air, and moisture. "Damping off" may occur and the seed-bed often becomes a veritable home for fostering fungal and bacterial diseases as well as insect pests. Again, when seedlings are clustered together, spraying to combat diseases or pests becomes a difficult problem, as application of the spray can be made only to a portion of the leaf surface. Thin planting and subsequent thinning are two factors which play a particularly large part in preventing outbreaks of Downy Mildew of Tobacco which is caused by a fungus, *Peronospora sp.* Initial care in this direction will save considerable time and expense later. By mixing with a suitable quantity of sand a more even and sparse distribution of small seeds may be made, particularly if sown through small holes made in the bottom of a tin.

When the conditions enumerated above are favourable and still a good germination does not occur, the source of the trouble is to be found definitely in the

seed. A general article entitled "Points in Purchasing Seeds" was included in the March issue of this *Journal*, and as several complaints have been received recently regarding seeds contained in packets, it is my intention in the following section to deal with "Packet Seeds."

## PACKET SEEDS.

In order to obtain some idea of the actual value of seeds contained in packets, a number were bought from various seed merchants and then subjected to a complete test with the following results:—

| Seedsman. | Seed. | Variety. | Purity. | Germination. | Good Average (eight years). | |
|---|---|---|---|---|---|---|
| | | | | | Purity. | Germination. |
| No. 1 | Parsnip | Hollow Crown | 99·1 | 46 | 99·0 | 65 |
| ,, | Pumpkin | Queensland Blue | 100·0 | 86 | 99·0 | 80 |
| ,, | Tomato | Ealiana | 100·0 | 94 | 99·0 | 85 |
| ,, | Spinach | Prickly | 98·9 | 72 | 99·0 | 50 |
| No. 2 | Cabbage | Succession | 99·2 | 61 | 99·0 | 75 |
| ,, | Beet | Crimson Globe | 99·4 | 65 | 99·0 | 65 |
| ,, | Swede | Laing's Garden | 99·3 | 89 | 99·0 | 85 |
| ,, | Carrot | Early Horn | 96·8 | 52 | 99·0 | 70 |
| No. 3 | Cauliflower | Autumn Giant | 95·7 | 94 | 99·0 | 70 |
| ,, | Cabbage | Vanguard | 99·8 | 75 | 99·0 | 75 |
| ,, | Carrot | St. Valery | 99·1 | 79 | 99·0 | 70 |
| ,, | Beet | Derwent Globe | 99·5 | 35 | 99·0 | 65 |
| No. 4 | Cauliflower | Autumn Giant | 99·8 | 70 | 99·0 | 70 |
| ,, | Onion | Early White Globe | 98·3 | 70 | 99·0 | 70 |
| ,, | Lettuce | Neopolitan | 99·9 | 98 | 99·0 | 90 |
| ,, | Radish | Icicle | 98·4 | 74 | 99·0 | 80 |

The germination figures in the good average column were compiled from results obtained over a period of the last eight years and, as stated, represent figures which may be expected from good average lines of seed. A general purity figure of 99.0 per cent. for all the seeds enumerated is satisfactory, conditionally that the impurities do not contain any serious weed seeds.

The purity of the lines received, taken as a whole, was quite good, only two of the sixteen being appreciably below the "good average" figure. The Autumn Giant Cauliflower from seedsman No. 3 contained a number of broken seeds which formed the main part of the 4.3 per cent. impurities. These broken seeds, if they germinate at all, give rise to malformed seedlings which do not survive. The Early Horn Carrot from seedsman No. 2 contained as its impurities broken seeds and small pieces of stick from the seed-bearing plants.

In the germination column, five of the sixteen are below the "good average" figures, six are considerably above them, and five approximately equal to them. Comparisons may be made between the cabbage seeds of seedsmen Nos. 3 and 2, which show 75 per cent. and 61 per cent. germination respectively, although the prices are the same. The difference between the beets of Nos. 3 and 2 is even more striking, thus demonstrating the large variation which occurs in the germination of packet seeds. Low germination is often associated with lack of vigour and the production of weak seedlings. Plants which are not strong and healthy in their young stages cannot be expected to produce satisfactory final results, no matter whether they are vegetables, agricultural crops or plants grown for decoration.

From the above table it may be seen that although the purity figures are generally satisfactory, the germination figures are not so consistent. Some are particularly good, while others are considerably below the figures calculated for good average lines. Firms which stamp figures for purity and germination on packets

give a guarantee which should be appreciated by seed buyers, as otherwise a certain amount of good fortune is entailed in obtaining satisfactory results from packet seeds.

The following table was compiled from results extending over the last eight years and represent good average figures for the vegetables listed, these being the most important packet seeds from an agricultural viewpoint. The fact that considerable seasonal variation sometimes occurs must be taken into consideration.

*Figures for good average lines of Vegetable Seeds.* (1932-33.)

| Seed. | Germination % |
|---|---|
| Asparagus | 65 |
| Beans | 90 |
| Beet | 65 |
| Broccoli | 75 |
| Cabbage | 75 |
| Celery | 60 |
| Cauliflower | 70 |
| Carrot | 70 |
| Cress | 90 |
| Cucumber | 85 |
| Leek | 75 |
| Lettuce | 90 |
| Marrow | 80 |
| Melon | 80 |
| Onion | 70 |
| Parsnip | 65 |
| Parsley | 60 |
| Peas | 90 |
| Pumpkin | 80 |
| Radish | 80 |
| Rhubarb | 60 |
| Spinach | 50 |
| Squash | 85 |
| Swede and Turnip | 85 |
| Tomato | 85 |

Impurities not to exceed 1 per cent.

## BUTTER-MAKING ON THE FARM.

G. K. BARON-HAY, Superintendent of Dairying.

In view of the numerous inquiries received regarding butter-making on the farm, it is hoped that the following article will prove of interest.

It, however, should be remembered that, while it may be desirable to make butter for use in the home, the production of large quantities of farm butter for sale is neither in the best interest of the farmer nor of the Butter Industry as a whole.

Such butter, from its nature, cannot keep under ordinary conditions. It invariably realises a price lower than that of butter made from pasteurised cream.

The consuming public have no guarantee that such butter is free from disease germs; and, if it is found in large quantities on the market, it tends to depress the price of all butter offered for sale.

However, if the precautions set out below are followed, wholesome butter of good quality may be produced for use on the farm.

It is proposed in this article to deal briefly with the points necessary to observe for successful butter-making under farm conditions—from the drawing of the milk to the finished product.

Butter-making on the farm can only be carried out successfully during the cooler months of the year. In the hot months the prevailing temperatures are so high as to make successful farm butter-making a difficult matter, unless a really good supply of fresh, cool water is available, such as a spring or well, and even then the loss of fat in the butter milk is often very high. Early morning churning, when the cream and water will be at their minimum temperature, is strongly recommended under such conditions. Standing the can containing the cream in a tub of water over-night assists in reducing the temperature.

If a factory is within reasonable distance it is more economical to supply the cream to the factory during the hot months where temperature can be controlled in the proper manner.

## BAD FLAVOURS IN BUTTER.

It is necessary for the butter-maker to recognise the unpleasant flavours in butter are caused, in the majority of cases, by bacteria or germs growing in the milk or cream and throwing down certain products which result in the development of unpleasant flavours in the butter. Milk drawn from the udder of a healthy cow is, practically speaking, free from germs which may affect the resultant butter. It is, therefore, during the milking process (on dust, hairs, etc.), while the milk is awaiting separation and during ripening of the cream (from the atmosphere—or dirty utensils) that germs gain access and start development.

Fortunately all germs do not produce unpleasant flavours. Some have the power of forming good acid flavours which assist in producing the sharp, clean pleasant flavour in the resultant butter so much desired by all butter-makers. If it is remembered that all bad germs are closely associated with *uncleanliness* and dirt, the necessity of producing and holding cream under perfectly clean conditions will be fully recognised, if a really first class article is to be manufactured.

## POINTS TO BE OBSERVED AT MILKING TIME.

Buckets used for milking should be perfectly clean. Scouring thoroughly with hot water and washing soda once a week, in addition to the usual daily washings, will lengthen the life of the buckets and help to keep them in good condition. Utensils should be dipped in scalding water before use, even though apparently clean.

The udder should be wiped over with a damp cloth to remove dust and dirt, which would otherwise fall into the bucket during milking.

The first stream of milk from each teat should be discarded and not used.

No matter what precautions are taken, a certain amount of dust and hair from the cow's body will get into the milk, and it is necessary to remove this by straining the milk when pouring into the vat from milking bucket.

## SEPARATION

Separation should be done as soon as possible after milking, while the milk is still warm, not less than 90deg. F. being desirable.

If the milk is allowed to cool, it will be necessary to heat it again before passing through the separator, otherwise a complete separation of the fat will be difficult to obtain and a higher amount than necessary will pass into skim milk.

There is also another reason for immediate separation. The separator acts to a certain extent as a remover of foreign matter, etc., which is deposited in the bowl with "separator slime," and the sooner this is removed from the milk the better chance will tbe cream have of developing into a first class article.

The separator should be thoroughly washed after *each* separation and the parts kept in a clean atmosphere where they can drain easily.

On no account should the cream from one milking be separated directly on to the cream from the previous milking. The cream from each milking should be kept separate until cooled somewhat; then they may be mixed and stirred thoroughly so that an even and uniform ripening will occur.

During the summer months it is necessary to cool the cream immediately after separating, if a first class butter is to be manufactured. This can be done by standing the can which contains the cream in a large vessel containing cool water, stirring the cream at frequent intervals to aid cooling. Several excellent small coil cream coolers are on the market, and their use is recommended to all dairymen.

## CREAM RIPENING.

Cream is fit to churn when it has developed a certain amount of acid, and in the summer this usually takes from 24 to 30 hours, and in the winter up to 48 hours.

The acid can be detected by—

1. Taste and smell.
2. Consistency—an acid cream appearing much thicker than a fresh cream.
3. On stirring it will present a shiny surface, which is not noticed in a fresh cream.

Cream should be stirred three times a day during the ripening process to obtain an even development.

## CHURNING.

Before use, the churn should be scalded and cooled thoroughly—with water.

The churning temperature of the cream is important, and in the hot months should be 50 to 54 degrees Fahrenheit if possible, and during the autumn from 56 to 60 degrees Fahrenheit. A dairy thermometer should always be used for checking the temperature in butter-making, and can be purchased for approximately 2s. 6d. When the butter begins to make its appearance in very small grains, stop the churn and wash down the sides and lid with a small amount of cold water (two degrees below the churning temperature of the cream, if possible). This helps the butter to form into proper grains, which allows churning to be continued until all the butter possible is obtained.

Continue churning until the grains have reached the size of wheat grains. Churning is now complete.

## WASHING THE BUTTER.

Draw off the butter milk and add plenty of cold water (if possible about two degrees below the churning temperature). This is the first wash water. Draw this off and add a fresh lot of water. The object of these washings is to

wash out all the butter milk, and as a rule two washings will be found sufficient for this purpose, *provided the butter is in the granular form stated above.*

## SALTING.

The butter may be salted in two ways—

1. In the churn, by adding a strong brine solution.
2. On the table, by adding salt.

## BRINE SALTING.

This method is probably advantageous in the summer months with small lots of butter—as the brine solution will have the effect of lowering the temperature and firming the butter.

The method of procedure is as follows:—

Add a strong brine solution to the churn immediately after the second washing has been drawn off—while the butter is still in the granular form—and mix thoroughly—allow to stand for five minutes—draw off brine and add fresh brine solution as before and allow to stand for five or ten minutes; then draw off and work in the usual manner. With this method the butter can only be lightly salted, and it may be found that the butter is not sufficiently salted for requirements. It is the more expensive method of the two, as more salt is required for the brine solution than is used in salting on the table.

## SALTING ON THE TABLE.

The butter is removed from the churn after the second washing, while still in the granular form.

Salt is added to suit the taste, but half an ounce of salt to one pound of butter may be taken as a guide to suit requirements. Use the finest ground salt obtainable and distribute evenly over the butter.

## WORKING.

The object of working is to work in the salt and work out the excess moisture. This may be done with the ordinary butter worker but, if this is not available, the butter can be worked with a pair of pats (Scotch hands) well scalded and cooled beforehand to prevent them sticking to the butter. Working is complete when the salt has been thoroughly worked in and the butter brought into a compact mass.

If the butter is required to be kept some time "boric acid" preservative may be added with the salt, but care must be taken not to add more than a quarter of an ounce of boric acid to four pounds of butter.

## PACKING.

Pack the butter neatly and evenly, and keep in a cool place free from odours.

Such articles as fish, meat, fruit, onions, oils, kerosene, paints, etc., will taint butter, and on no account should they be stored near each other. If it is desired to store butter for a month or two for home use, it is advisable to provide earthenware jars. Cleanse thoroughly, fill with butter, well packed to within an inch of the top, then add a layer of damp salt. Next pour a layer of melted butter over the salt, cover with a piece of parchment paper and store in a dry cool place.

# THE M. T. PADBURY TROPHY COMPETITION.

I. Thomas,

Superintendent of Wheat Farms.

This competition, which has been conducted for the past three years, was inaugurated as the result of a generous donation made by Mr. M. T. Padbury, a prominent pioneer farmer of the Moora district, and will extend over a total period of ten years.

The allocation of the funds has been so arranged that a replica of the main shield is awarded each year to the competitor who that year produces the highest acre yield per inch of rainfall during the growing season (May 1st to October 31st).

The conditions under which this competition will be conducted are as follow:—

1. The Competition will commence with the 1930/31 harvest and continue for a period of 10 years. At the end of that period the Trophy will be awarded to the competitor who has taken part in the Competition for at least five years, and who obtains the greatest mean average acre yield per inch of rainfall during the conventional growing period. The mean average yield will be computed from the results of the five seasons in which the competitor produced the highest acre yield per inch of rainfall during the growing period. In the event of a tie, the Competition will continue between the leading competitors until an advantage is gained by one of them.
2. The conventional growing period for any year will be that decided upon and announced by the Royal Agricultural Society. For the first year and until further notice, it has been decided that it will be from May 1st to October 31st, inclusive.
3. Until the end of the Competition the Trophy will be in the custody of the Royal Agricultural Society, and will be displayed at any agricultural exhibition held by that Society.
4. Each year the competitor who obtains the best average acre yield per inch of rainfall during the conventional growing period will be awarded a replica of the Trophy. His name will also be inscribed upon a small shield affixed to the Trophy.
5. The rainfall upon which the award will be made will be determined by the Commonwealth Meteorologist from the district records and his decision in this matter will be final.
6. The Competition will be limited to those farmers who harvest at least 200 acres of wheat for grain. Where a competitor is financially interested in the crops grown on one or more farms, he will be required to supply details regarding the production and marketing of the crops on same, and though usually the award will be made upon the results from the farm nominated by the competitor, yet the Royal Agricultural Society may require that the crops on these farms be included in the competing area.
7. The average yield will be ascertained from the total area—including self-sown crops—harvested for grain and determined from the actual amount of wheat sold as shown by the delivery dockets, plus the amount retained for seed, for home use or for any other purpose.
8. The method of judging will be as follows:—At a convenient time the area harvested for grain will be measured and the quantity of wheat on hand ascertained. On or before January 31st, the farmer will be required to

furnish the judge with a sworn declaration as to the quantity of wheat sold from the competing holding or holdings, and the amount retained for seed and other purposes; the statement regarding the amount sold to be supported by agents' dockets. The judge, after satisfying himself as to the correctness of this statement, will compute the average yield per acre per inch of rainfall during the growing period from the information received.

9. The judge will be appointed by the Director of Agriculture, and his decision will be final.

10. Nominations for this Competition will be received by the Royal Agricultural Society up to the 31st October each year.

The winner this year was Mr. O. J. Butcher of Pithara, who obtained an average of 2 bushels 42 lbs. per inch of rainfall over an area of just over 600 acres. He was closely followed by Mr. L. T. C. Barnett of Walgoolan with 2 bushels 34 lbs., and Hon. T. Moore, M.L.C., of Indarra, with 2 bushels 33 lbs.

Last year's winners were Messrs. F. M. and J. L. Atkins of Jouerdine, with an average yield of 3 bushels per inch of rainfall. The previous year, the competition was won by Mr. F. A. Williams, of Mangowine, with an average of 3 bushels 23 lbs. per inch of rainfall.

The results for 1932 are set out in the following table:—

M. T. PADBURY TROPHY COMPETITION, 1932.

| Competitor. | Address. | Rainfall during growing period. | Area harvested. | Yield. | | |
|---|---|---|---|---|---|---|
| | | | | Gross. | Average per acre. | Average per 1 inch of growing period rain. |
| | | points. | acres. | bus. | bus. lb. | bus. lb. |
| Butcher, O. J. ... ... | Pithara ... ... | 1,157 | 609 | 19,001 | 31 12 | 2 42 |
| Barnett, L. T. C. ... | Walgoolan ... ... | 1,230 | 393 | 12,370 | 31 29 | 2 34 |
| Moore, T., Hon. ... ... | Indarra ... ... | 1,161 | 261 | 7,745 | 29 40 | 2 33 |
| Nottage, R. B. ... ... | Tammin ... ... | 1,335 | 340 | 10,704 | 31 29 | 2 21 |
| Evans, L. D. ... ... | Nukarni ... ... | 1,077 | 332 | 8,397 | 25 18 | 2 21 |
| Manuel, C. J. ... ... | Mukinbudin ... | 961 | 366 | 7,327 | 20 1 | 2 5 |
| Scadding, N. A. ... | Kulin ... ... | 1,535 | 482 | 15,308 | 31 46 | 2 4 |
| Bishop, H. F. ... ... | Lake Grace ... | 1,361 | 200 | 5,415 | 27 5 | 1 59 |
| McLennan, Est. ... ... | Borden ... ... | 1,334 | 253 | 6,452 | 25 30 | 1 55 |
| Stewart, W. B. ... ... | Gnowangerup ... | 1,412 | 283 | 7,608 | 26 53 | 1 54 |
| Bremner, J. R. & Sons ... | Corrigin ... ... | 1,494 | 917 | 24,660 | 26 54 | 1 48 |
| Morcombe, P. T. ... | Waddy Forest ... | 1,415 | 403 | 10,275 | 25 30 | 1 48 |
| Creagh Bros. ... ... | Kwelkan ... ... | 1,098 | 1,039 | 19,526 | 18 48 | 1 43 |
| Williams, F. A. ... ... | Mangowine ... | 930 | 356 | 5,196 | 14 36 | 1 34 |
| Prowse, E. W. ... ... | Doodlakine ... | 1,281 | 623 | 12,257 | 19 40 | 1 31 |
| Richardson Bros. ... | Bonnie Rock ... | 965 | 333 | 4,649 | 13 58 | 1 27 |
| Richards, A. ... ... | S. Caroling-Dangin | 2,080 | 226 | 5,388 | 23 50 | 1 9 |
| Horsman and Sons ... | Bilbarin ... ... | 1,781 | 350 | 6,733 | 19 14 | 1 5 |

## BETTER DAIRYING COMPETITION, 1933.

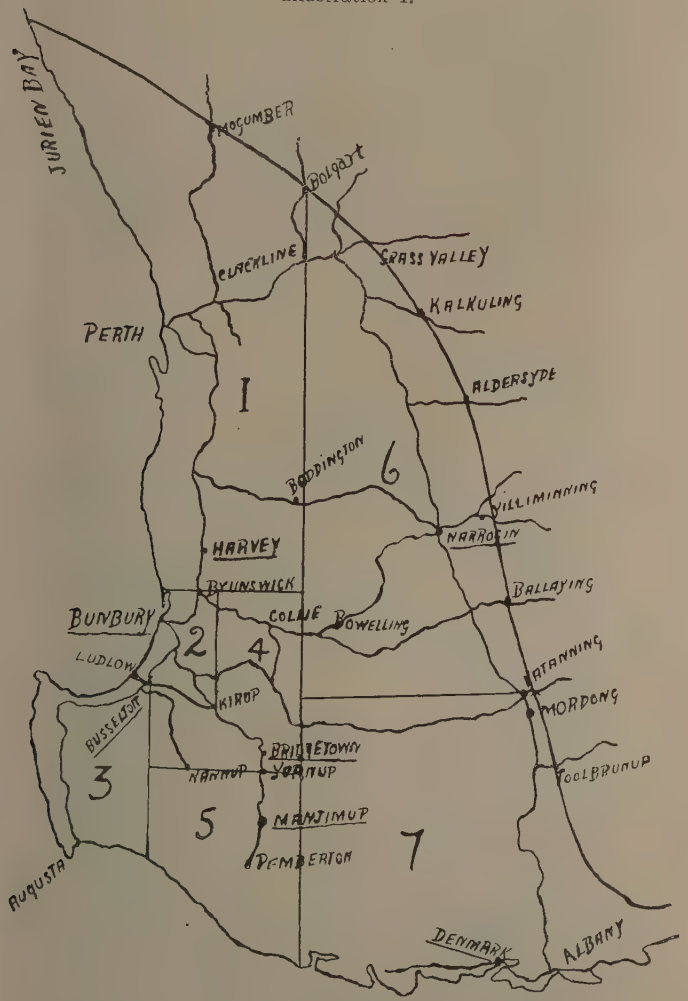
G. K. BARON-HAY, Superintendent of Dairying.

So encouraging were the results of the Better Dairying Competition which was conducted last year, that the Western Australian Committee of the Australian Dairy Council decided to conduct a similar competition for the season 1932-1933, the judging to be carried out again by the officers of the Dairy Branch, Department of Agriculture.

The plan of the competition was similar to that of last year, with variations in detail, as a result of the experience gained from the first competition.

For the purposes of the competition the Clover or Dairy Belt (*i.e.*, land enjoying a rainfall of 20 inches or more) was divided into seven zones, as shown on the following map, and in these sub-divisions an endeavour was made to group farms under as identical conditions as possible.

Illustration 1.




*Note.*—The Southern boundary of Zone 6 is now a direct line through Mt. Barker.

The objective of the W.A. Committee of the Australian Dairy Council is to encourage the development of pasture, fodder crops, and the conservation of fodders. With this end in view the farms were so judged as to make all phases of the farm practise subservient to these considerations.

Thanks are due to the Central Agricultural Societies in each zone, namely, Harvey, Bunbury, Busselton, Bridgetown, Manjimup, Narrogin and Denmark, whose committees co-operated with the Department of Agriculture and the Dairy Council in distributing literature and receiving entries. Of special value also was the advice of Mr. P. Rose, who assisted in framing the schedule of points for the purpose of judging.

## CHAMPION DISTRICT SHIELD.

An innovation has been made possible this year through the generosity of Cuming Smith-Mt. Lyell Farmers' Fertiliser Company, who donated a beautifully designed shield to be awarded to the district having the four leading farms. The shield is to be competed for during five years, and finally held by the district winning the shield the greatest number of times during that period. (Illustration 2.)

Illustration 2.

Shield donated by Cuming Smith Mt. Lyell Farmers' Fertilser Co.
To be held by the zone containing the four leading farmers.

The main headings under which competitiors were judged and points allotted were as follows:—

| | Total. |
|---|---|
| 1. **Farm Management.**—Includes lay-out and convenience, general management, sanitation; Book-keeping and records .. .. | 75 |
| 2. **Dairy Herd.**—Includes system of breeding, dairy type and condition; herd sire, breed and conditions of pigs .. .. .. | 100 |
| 3. **Pasture and Fodder Crops.**—Includes condition of pasture—management; fertilising and type-character, and cultivation of fodder crops .. .. .. .. .. .. .. .. .. | 100 |
| 4. **Fodder Conservation.**—Includes silage, type, mixture, percentage waste; Hay, type and condition. Amount of conserved fodder per head of dairy stock and convenience for feeding .. .. .. | 150 |
| 5. **Separated Milk.**—Utilisation of for calves, pigs, fowls, etc. .. | 25 |
| 6. **Butter Fat Production.**—Includes production January to December, 1932; production per acre .. .. .. .. .. .. | 50 |
| Grand Total .. | 500 |

A perusal of the above schedule will disclose the great importance attached to pasture, fodder crops, and fodder conservation by the Committee, as half the total points are allotted to these items.

Owing to the large area covered by the Competition, which provided varying climatic and seasonal conditions and rainfall ranging from 20 inches to 70 inches, it was found necessary to judge the farms in zones at different periods of the year, as folows:—

Zone 1.—Centre, Harvey—After December 1, 1932.

Zone 2.—Centre, Bunbury—After January 1, 1933.

Zone 3.—Centre, Margaret River—After December 15, 1932.

Zone 4.—Centre, Bridgetown—After January 15, 1933.

Zone 5.—Centre, Manjimup—After January 15, 1933.

Zone 6.—Centre, Narrogin—After February 15, 1933.

Zone 7.—Centre, Denmark—After January 15, 1933.

The Committee of the Australian Dairy Council decided to increase the prizes offered as follows:—

First Prize in each Zone—£12.
Second Prize in each Zone—£7.
Third Prize in each Zone—£5.
Fourth Prize in each Zone—£3.

In Zone 6, Centre Narrogin, where a "Fodder Conservation Competition" only was conducted, special prizes as under were donated:—

First Prize, £10.
Second Prize, £7.
Third Prize, £5.
Fourth Prize, £3.

The following tables, 1 to 7, set out in detail the points obtained by each competitor in the various zones.

TABLE 1.—POINTS GAINED BY COMPETITORS.

*Zone* 1.—*Centre Harvey Agricultural Society.*

Judge: H. G. Elliott, Agricultural Adviser, Dairy Branch.

| | Max. Points. | S. F. Russell. | T. Briggs. | H. J. W. Masters. | S. Bowers. | L. Temple. | A. E. Clifton. |
|---|---|---|---|---|---|---|---|
| FARM MANAGEMENT—(75 points). | | | | | | | |
| (a) Lay-out and Conveniences ... ... | 30 | 29 | 19 | 24 | 15 | 22 | 18 |
| (b) General Management, including Sanitation, etc. ... ... ... ... | 25 | 23 | 16 | 19 | 16 | 21 | 14 |
| (c) Book-keeping and Records ... ... | 20 | 20 | 15 | 16 | 9 | 9 | 5 |
| 2.—DAIRY HERD—(100 points). | | | | | | | |
| (a) Breeding—System of ... ... ... | 25 | 23 | 23 | 20 | 21 | 22 | 18 |
| (b) Dairy Type and Conditions ... ... | 30 | 26 | 26 | 23 | 26 | 25 | 20 |
| (c) Bull (give particulars of breeding and production ancestry) ... ... | 25 | 25 | 25 | 20 | 20 | 25 | 18 |
| (d) Pigs—Breed, condition, etc. ... ... | 20 | 18 | 17 | 10 | 18 | 20 | 14 |
| 3.—PASTURE AND FODDER CROPS—(100 points). | | | | | | | |
| (a) Pasture ... ... ... ... ... | 60 | † 85 | 37 | †71 | 37 | † 74 | † 59 |
| (b) Fodder Crops ... ... ... ... | 40 | † 71 | 38 | ... | 22 | †69 | ... |
| 4.—FODDER CONSERVATION—(150 points). | | | | | | | |
| (a) Silage— | | | | | | | |
| 1. Succulency ... ... ... | 20 | ... | 20 | 18 | 20 | ... | 18 |
| 2. Mixture ... ... ... ... | 20 | ... | 17 | 17 | 18 | ... | 17 |
| 3. Type of Silage ... ... ... | 10 | ... | 9 | 8 | 8 | ... | 8 |
| 4. Percentage Waste ... ... | 20 | ... | 16 | 17 | 17 | ... | 14 |
| (b) Hay— | | | | | | | |
| 1. Mixture ... ... ... ... | 20 | 19 | 16 | 18 | 18 | ... | 18 |
| 2. Condition ... ... ... | 20 | 19 | 13 | 18 | 18 | ... | 10 |
| (c) Amount of Fodder conserved per head | 20 | 20 | 14 | 13 | 8 | 7 | 7 |
| (d) General Lay-out for convenience in feeding ... ... ... ... | 20 | 19 | 15 | 16 | 13 | 15 | 15 |
| 5.—UTILISATION OF SEPARATED MILK FOR PIGS, POULTRY, ETC.—(25 points). | | | | | | | |
| (a) Pigs ... ... ... ... ... | 20 | *20 | *16 | *10 | † 19 | 20 | † 20 |
| (b) Poultry ... ... ... ... ... | 5 | 5 | 4 | 3 | 4 | 4 | 4 |
| 6.—BUTTER FAT PRODUCTION (per acre) ... | 50 | 50 | 18 | 38 | 44 | 46 | 21 |
| | ... | 115 | 300 | 90 | 110 | 89 | 200 |
| Total ... ... | 500 | 472 | 384 | 379 | 371 | 369 | 318 |

*Partly or wholly on the whole milk trade. † Calculated on a *pro rata* basis.

TABLE 2.—POINTS GAINED BY COMPETITORS.

*Zone 2.—Centre Bunbury Agricultural Society.*

Judge: M. Cullity, Agricultural Adviser, Dairy Branch.

| | H. Noon, Katterup. | P. Rose, Burekup. | Norton Bros., Capel. | J. Hearman, Donnybrook. | A. Trigwell, Donnybrook. | W. J. Sears, Donnybrook. | J. H. Brett, Dardanup. | Dunkley Bros., Capel. | L. A. Poad, Dardanup. |
|---|---|---|---|---|---|---|---|---|---|
| FARM MANAGEMENT. | | | | | | | | | |
| Lay-out ... ... | 22 | 25 | 16 | 19 | 14 | 21 | 23 | 13 | 21 |
| General Management ... | 21 | 25 | 19 | 17 | 15 | 21 | 23 | 17 | 13 |
| Books and Records ... | 16 | 15 | 18 | 12 | 5 | 12 | 12 | 15 | 7 |
| DAIRY HERD. | | | | | | | | | |
| Breeding ... ... | 22 | 25 | 19 | 19 | 22 | 18 | 18 | 21 | 20 |
| Dairy Type and Condition ... ... | 25 | 28 | 23 | 22 | 28 | 25 | 24 | 25 | 23 |
| Bull ... ... ... | 22 | 25 | 23 | 21 | 21 | 22 | 17 | 25 | 25 |
| Pigs ... ... ... | 20 | 20 | 10 | 5 | 12 | 3 | 10 | 4 | 10 |
| Pasture ... ... | 50 | 47 | 57 | 41 | 44 | 42 | 37 | 55 | 40 |
| Fodder Crops ... ... | 15 | 2 | 3 | 4 | ... | ... | 40 | ... | 19 |
| Silage— | | | | | | | | | |
| Succulency ... | 17 | 16 | 17 | 18 | 18 | 19 | ... | 20 | ... |
| Mixture ... ... | 16 | 16 | 16 | 18 | 15 | 17 | ... | 20 | ... |
| Type ... ... | 8 | 7 | 7 | 9 | 9 | 9 | ... | 10 | ... |
| Waste ... ... | 12 | 6 | 15 | 18 | 10 | 14 | ... | 16 | ... |
| Hay— | | | | | | | | | |
| Mixture ... ... | 18 | 16 | 17 | 18 | 17 | 15 | 20 | 19 | 18 |
| Condition ... ... | 17 | 18 | 20 | 17 | 17 | 15 | 17 | 20 | 18 |
| Amount per head ... | 30 | 33 | 27 | 49 | 44 | 49 | 47 | 18 | 19 |
| Convenience in feeding | 13 | 19 | 17 | 17 | 14 | 14 | 19 | 14 | 14 |
| Skim Milk and Poultry | 21 | 20 | 19 | 12 | 17 | 15 | 16 | 17 | 16 |
| Butter Fat (per acre) | 34 | 22 | 33 | 38 | 49 | 37 | 39 | 26 | 34 |
| Total Points ... | 399 | 383 | 381 | 374 | 371 | 368 | 362 | 355 | 302 |

Illustration 3.

Mr. A. Trigwell's herd, Donnybrook.
This herd produced 64 lbs. of fat per acre, the highest in Zone 2.

TABLE 3.—POINTS GAINED BY COMPETITORS.

*Zone 3.—Margaret River and Busselton Agricultural Society.*

Judge : C. GILES—Dairy Instructor, Dairy Branch.

| — | Max. Points. | C. H. Ironmonger. | A. Miller. | H. Eddy. | A. Oldfield. | E. C. Melville. | J. J. Burge. | S. Smith. | A. W. Langly. | M. Torrent. | J. A. Doyle. | W. J. Bryant. | Reading Bros. | W. J. Johnston. | G. Dabbs. | D. O. Briggs. | Beacham. | J. Angell. | H. Fisher. | W. Still. | N. Short. | J. W. Marshall. | M. R. May. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. FARM MANAGEMENT (75 points.) | | | | | | | | | | | | | | | | | | | | | | | |
| (a) Lay-out and Convenience ... ... | 30 | 20 | 26 | 24 | 28 | 21 | 25 | 29 | 22 | 18 | 24 | 24 | 22 | 22 | 20 | 18 | 20 | 18 | 20 | 20 | 18 | 16 | 18 |
| (b) General Management, including Sanitation, etc. | 25 | 20 | 22 | 22 | 22 | 18 | 22 | 25 | 16 | 14 | 16 | 20 | 17 | 15 | 18 | 17 | 16 | 15 | 22 | 16 | 16 | 16 | 16 |
| (c) Book-keeping and Records ... ... | 20 | 17 | 18 | 16 | 18 | 18 | 16 | 18 | 15 | 17 | 18 | 15 | 18 | 18 | 15 | 15 | 15 | 18 | 15 | 12 | 15 | 15 | 15 |
| 2. DAIRY HERD—(100 points.) | | | | | | | | | | | | | | | | | | | | | | | |
| (a) Breeding System of ... ... ... | 25 | 25 | 20 | 20 | 20 | 25 | 22 | 22 | 18 | 15 | 15 | 20 | 22 | 20 | 20 | 20 | 10 | 20 | 20 | 20 | 20 | 20 | 20 |
| (b) Dairy, Type and condition ... ... | 30 | 28 | 24 | 26 | 22 | 22 | 24 | 28 | 22 | 20 | 16 | 24 | 20 | 16 | 19 | 22 | 17 | 17 | 22 | 18 | 17 | 16 | 17 |
| (c) Bull (give particulars of breeding and production ancestry) | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 15 | 15 | 25 | 25 | 25 | 25 | 25 | 15 | 25 | 25 | 25 | 15 | 25 | 25 |
| (d) Pigs—Breed, condition, etc. ... .. | 20 | 16 | 18 | 19 | 18 | 18 | 18 | 16 | 18 | 18 | 18 | 18 | 15 | 16 | 19 | 18 | 16 | 15 | 16 | 18 | 16 | 18 | 16 |
| (3) PASTURE AND FODDER CROPS—(100 points.) | | | | | | | | | | | | | | | | | | | | | | | |
| (a) Pasture ... ... ... ... ... | 60 | 56 | 56 | 54 | 50 | 42 | 40 | 58 | 54 | 45 | 42 | 55 | 40 | 35 | 50 | 42 | 42 | 60 | 50 | 55 | 50 | 40 | 40 |
| (b) Fodder Crops ... ... ... ... | 40 | 8 | 8 | ... | 2 | 18 | 15 | ... | 7 | 20 | 30 | 11 | 11 | 12 | 5 | 20 | 11 | 3 | ... | 6 | 8 | 5 | 12 |
| 4. FODDER CONSERVATION—(180 points). | | | | | | | | | | | | | | | | | | | | | | | |
| (a) Silage :— | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Succulency ... ... ... ... | 20 | 18 | 18 | 17 | 18 | 16 | 18 | ... | 14 | 15 | 14 | ... | 18 | 16 | 16 | ... | 15 | ... | ... | ... | 12 | 20 | ... |
| 2. Mixture ... ... ... ... | 20 | 20 | 20 | 20 | 20 | 18 | 20 | ... | 20 | 15 | 16 | ... | 20 | 20 | 15 | ... | 15 | ... | ... | ... | 18 | | ... |
| 3. Type of Silage ... ... ... | 10 | 9 | 9 | 9 | 9 | 9 | 9 | ... | 8 | 7 | 8 | ... | 9 | 9 | 7 | ... | 7 | ... | ... | ... | 5 | | ... |
| 4. Percentage of Waste ... ... | 20 | 14 | 14 | 15 | 14 | 14 | 12 | ... | 11 | 10 | 12 | ... | 15 | 10 | 8 | ... | 10 | ... | ... | ... | 5 | | ... |
| (b) Hay :— | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Mixture ... ... ... ... | 20 | 18 | 18 | 17 | 18 | 18 | 18 | 18 | 18 | 18 | 17 | 18 | 17 | 18 | 16 | 17 | 17 | 16 | 18 | 17 | 18 | 16 | 17 |
| 2. Condition ... ... ... ... | 20 | 16 | 18 | 16 | 16 | 15 | 18 | 18 | 16 | 15 | 16 | 16 | 16 | 17 | 16 | 15 | 16 | 14 | 16 | 16 | 16 | 15 | 17 |
| (c) Amount of Fodder conserved per head ... | 50 | 45 | 40 | 28 | 42 | 26 | 50 | 50 | 30 | 33 | 33 | 45 | 16 | 26 | 30 | 25 | 33 | 28 | 30 | 30 | 15 | 16 | 28 |
| (d) General lay-out for convenience in feeding | 20 | 12 | 14 | 12 | 13 | 14 | 14 | 18 | 12 | 12 | 12 | 12 | 14 | 12 | 12 | 12 | 14 | 12 | 12 | 14 | 12 | 10 | 12 |
| 5. UTILISATION OF SEPARATED MILK FOR PIGS, POULTRY, ETC.—(25 points). | | | | | | | | | | | | | | | | | | | | | | | |
| (a) Pigs .. ... ... ... ... ... | 20 | 20 | 12 | 20 | 20 | 20 | 3 | 20 | 15 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 18 | 20 | 14 | 20 | 20 |
| (b) Poultry ... ... ... ... ... | 5 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 2 | 4 | 3 | 3 | 3 | 4 | 3 | 4 | 4 | 4 | 3 | 2 | 2 | 4 | 2 |
| 6. BUTTER FAT PRODUCTION—(62 points). | 62 | 38 | 42 | 61 | 27 | 44 | 27 | 41 | 44 | 54 | 31 | 45 | 32 | 34 | 27 | 35 | 11 | 36 | 33 | 28 | 17 | 34 | 18 |
| Acres devoted to Dairy Farming ... ... | ... | 110 | 100 | 68 | 100 | 103 | 125 | 68 | 120 | 60 | 50 | 58 | 250 | 65 | 56 | 55 | 100 | 47 | 98 | 56 | 75 | 70 | 120 |
| Total ... ... ... | ... | 427 | 425 | 425 | 405 | 404 | 399 | 390 | 387 | 385 | 376 | 371 | 370 | 365 | 361 | 325 | 324 | 321 | 320 | 317 | 309 | 306 | 293 |

TABLE A.—POINTS GAINED BY COMPETITORS.

*Zone 4.—Centre Bridgetown Agricultural Society.*

Judge: M. CULLITY, Agricultural Adviser, Dairy Branch.

| | A. Hayward. | H. E. Kendal. | A. Lindsay. | V. A. Doust. | G. E. White. | F. C. Wiseman. | F. O. Nelson. | G. H. Dixon. |
|---|---|---|---|---|---|---|---|---|
| FARM MANAGEMENT. | | | | | | | | |
| Lay-out and convenience ... | 23 | 20 | 21 | 20 | 19 | 20 | 25 | 21 |
| Management and Sanitation ... | 18 | 20 | 17 | 20 | 19 | 16 | 24 | 20 |
| Records and Book-keeping ... | 12 | 15 | 8 | 16 | 9 | 11 | ... | 13 |
| DAIRY HERD. | | | | | | | | |
| Breeding—System of ... ... | 19 | 21 | 19 | 21 | 19 | 20 | 22 | 20 |
| Type and Condition ... ... | 23 | 25 | 23 | 26 | 26 | 28 | 25 | 25 |
| Bull ... ... ... ... ... | 22 | 22 | 23 | 23 | 19 | 17 | 24 | 23 |
| Pigs ... ... ... ... | 11 | 1 | 10 | 1 | 20 | ... | 16 | 16 |
| Pasture ... ... ... ... | 41 | 39 | 40 | 47 | 42 | 38 | 43 | 39 |
| Fodder Crops ... ... ... | ... | 9 | 8 | ... | 2 | 2 | ... | 11 |
| Silage: | | | | | | | | |
| Succulency ... ... | 19 | 17 | 19 | 20 | 17 | 19 | ... | ... |
| Mixture ... ... ... | 18 | 17 | 20 | 20 | 15 | 19 | ... | ... |
| Type ... ... ... | 10 | 8 | 10 | 10 | 7 | 10 | ... | ... |
| Percentage Waste ... ... | 11 | 10 | 19 | 16 | 14 | 18 | ... | ... |
| Hay: | | | | | | | | |
| Mixture ... ... ... | 20 | 18 | 19 | 19 | 16 | 18 | 19 | 17 |
| Condition ... ... ... | 20 | 18 | 20 | 20 | 19 | 12 | 19 | 16 |
| Amount of Fodder conserved per head ... ... ... | 37 | 50 | 39 | 17 | 23 | 8 | 20 | 15 |
| General Lay-out for convenience in feeding ... ... ... | 17 | 12 | 14 | 14 | 12 | 10 | 20 | 10 |
| Skim Milk—Utilisation ... | 15 | 12 | 10 | 10 | 17 | 7 | 18 | 11 |
| Butter Fat per acre ... ... | 36 | 32 | 29 | 25 | 28 | 35 | 29 | 43 |
| Total Points ... ... | 372 | 366 | 363 | 345 | 343 | 308 | 304 | 300 |

Illustration 4.

H. C. Barnsby, Clovelly Farm, Pemberton.
Feeding Millet.

TABLE 5.—POINTS GAINED BY COMPETITORS.

*Zone 5.—Centre Manjimup Agricultural Society.*

Judge: M. Cullity, Agricultural Adviser, Dairy Branch.

| | H. C. Barnaby. | S. Gray. | H. Brown. | G. F. Combe. | B. Young. | Mr. & Mrs. H. Grumpelt. | H. F. Jay. | Mrs. Armstrong. | W. Cox. | A. V. Kjellgren. |
|---|---|---|---|---|---|---|---|---|---|---|
| FARM MANAGEMENT. | | | | | | | | | | |
| Lay-out, etc. ... ... | 20 | 21 | 19 | 22 | 20 | 18 | 18 | 18 | 16 | 25 |
| Management and Sanitation ... ... ... | 24 | 24 | 18 | 23 | 23 | 23 | 21 | 19 | 19 | 25 |
| Books and Records ... | 18 | 5 | 13 | 10 | 5 | 15 | 17 | 10 | 5 | 7 |
| DAIRY HERD. | | | | | | | | | | |
| Breeding—System ... | 18 | 18 | 20 | 25 | 17 | 22 | 17 | 15 | 17 | 19 |
| Dairy Type and Condition ... ... | 24 | 27 | 24 | 28 | 22 | 25 | 21 | 18 | 20 | 22 |
| Bull ... ... ... | 17 | 17 | 25 | 25 | 23 | 24 | 25 | 12 | 23 | 22 |
| Pigs ... ... ... | 15 | 12 | 2 | 8 | 10 | 4 | 20 | 3 | 1 | 1 |
| Pasture ... ... | 41 | 49 | 42 | 38 | 39 | 38 | 39 | 34 | 34 | 41 |
| Fodder Crops ... ... | 35 | 33 | 21 | ... | ... | ... | 35 | 20 | ... | ... |
| Silage— | | | | | | | | | | |
| Succulency ... | 20 | 18 | 20 | 20 | 19 | 18 | ... | 20 | 19 | 17 |
| Mixture ... ... | 19 | 15 | 20 | 17 | 20 | 17 | ... | 20 | 19 | 17 |
| Type ... ... | 9 | 9 | 10 | 9 | 10 | 10 | ... | 10 | 9 | 7 |
| Percentage Waste ... | 18 | 18 | 18 | 18 | 19 | 12 | ... | 15 | 17 | 10 |
| Hay— | | | | | | | | | | |
| Mixture ... ... | 19 | 18 | 18 | 17 | 19 | 19 | 19 | 17 | 18 | 16 |
| Condition ... ... | 19 | 19 | 17 | 17 | 19 | 20 | 18 | 18 | 19 | 17 |
| Amount Fodder conserved per head ... | 50 | 50 | 50 | 50 | 49 | 36 | 41 | 46 | 49 | 40 |
| General Lay-out for convenience in feeding... | 17 | 13 | 16 | 19 | 17 | 14 | 15 | 15 | 18 | 14 |
| Skim Milk—Utilisation | 22 | 16 | 10 | 16 | 12 | 12 | 16 | 10 | 12 | 14 |
| Butter Fat (per acre) ... | 36 | 32 | 31 | 22 | 32 | 23 | 26 | 27 | 26 | 26 |
| Total Points ... | 441 | 412 | 394 | 386 | 375 | 358 | 348 | 347 | 341 | 340 |

## ZONE 6—CENTRE NARROGIN.

This Zone (see Map Illustration) embraces land lying either side of the Great Southern Railway from approximately Northam to Mt. Barker, the rainfall being from 20-25 inches. Whilst primarily considered as suitable for oats and sheep, the production of butter fat has approximately doubled during the last three years. The most important factor for successful dairying in this area is undoubtedly **Fodder Conservation.** The Committee therefore decided to conduct a special "Fodder Conservation Competition" in this zone, under the following conditions:—

| | | Points. |
|---|---|---|
| Fodder conserved per head of dairy cows .. .. | | 50 |
| Use of Phosphatic Licks .. .. .. .. | | 25 |
| Silage— | | |
| Mixture .. .. .. .. .. | 20 | |
| Type and Palatability .. .. .. | 30 | |
| Percentage Waste .. .. .. | 30 | |
| Time of Cutting .. .. .. | 10 | |
| Workmanship, Finish .. .. .. | 10 | |
| | | 100 |
| | | 175 |

Where summer fodder is grown to replace silage, these crops to be judged on the following scale of points:—

| | |
|---|---|
| Yield based on food value per acre .. | 50 |
| Freedom from weeds .. .. | 15 |
| Cultivation .. .. .. .. | 15 |
| Disease, freedom from .. .. | 10 |
| Evenness of growth .. .. .. | 10 |
| | 100 |

Where both silage and summer fodders are provided, the scale of points to be halved in each case, so that the total shall remain 100.

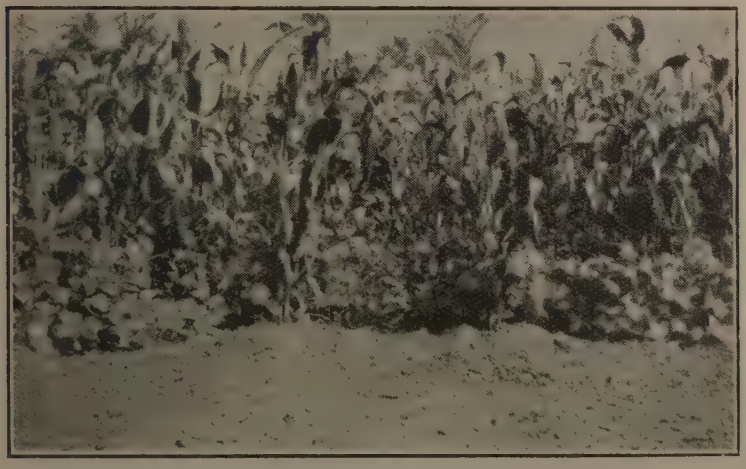
TABLE 6.—POINTS GAINED BY COMPETITORS.

*Zone 6.—Centre Narrogin Agricultural Society.*

Judge: H. G. Elliott, Agricultural Adviser, Dairy Branch.

| —— | Points. | W. G. Burges, York. | E. McManus, Northam. | T. A. Hardie & Son, Narrogin. | D. Bradford, Narrogin. | L. P. James, Cranbrook. | W. Chester, Mt. Barker. | R. McDougall, Narrogin. |
|---|---|---|---|---|---|---|---|---|
| Fodder conserved per head of Dairy Cows ... ... ... | 50 | 50 | 50 | 50 | 50 | 50 | 37 | 43 |
| Use of Phosphatic Licks ... | 25 | 25 | 20 | 25 | 20 | ... | 20 | 10 |
| Silage—(100 points)— | | | | | | | | |
| Material and Mixture ... | 20 | 16 | 9 | 8 | 7 | ... | 9 | ... |
| Type and Palatability ... | 30 | 15 | 14 | 11 | 11 | ... | 11 | ... |
| Percentage Waste ... ... | 30 | 15 | 14 | 8 | 10 | ... | 8 | ... |
| Time of Cutting ... ... | 10 | 5 | 5 | 5 | 3 | ... | 5 | ... |
| Workmanship, Finish, etc.... | 10 | 5 | 5 | 3 | 3 | ... | 2 | ... |
| Fodder Crops—(100 points)— | | | | | | | | |
| Yield based on Food Value (per acre) ... ... | 50 | 20 | 15 | 15 | 15 | 40 | 20 | 34 |
| Freedom from Disease ... | 10 | 5 | 5 | 5 | 5 | 10 | 5 | 9 |
| Freedom from Weeds ... | 15 | 6 | 6 | 6 | 6 | 13 | 7 | 13 |
| Cultivation and Manuring ... | 15 | 7 | 6 | 5 | 5 | 13 | 6 | 13 |
| Evenness of Growth ... | 10 | 4 | 3 | 4 | 4 | 9 | 3 | 6 |
| Total ... | 175 | 167 | 152 | 145 | 139 | 135 | 133 | 128 |

Illustration 5.



Maize and Cow Peas grown by S. F. Russell, Serpentine.

TABLE 7.—POINTS GAINED BY COMPETITORS.

*Zone 7.—Centre Denmark Agricultural Society.*

Judge: H. G. ELLIOTT, Agricultural Adviser, Dairy Branch.

| | Max. Points. | Bayley Bros., Denmark. | J. Daly, Bornholm. | L. Hargrave. | F. C. Smith. | P. Berridge. | W. Nancarrow. |
|---|---|---|---|---|---|---|---|
| 1. FARM MANAGEMENT—(75 points). | | | | | | | |
| (a) Lay-out and Convenience ... ... | 30 | 27 | 20 | 21 | 22 | 20 | 18 |
| (b) General Management, including Sanitation, etc. ... ... ... ... | 25 | 23 | 19 | 18 | 19 | 15 | 15 |
| (c) Book-keeping and Records ... ... | 20 | 18 | 8 | 10 | 12 | 11 | 5 |
| 2. DAIRY HERD—(100 points.) | | | | | | | |
| (a) Breeding—System of ... ... ... | 25 | 20 | 18 | 15 | 16 | 17 | 15 |
| (b) Dairy—Type and Condition ... ... | 30 | 24 | 23 | 22 | 23 | 21 | 22 |
| (c) Bull (give particulars of breeding and production ancestry) ... ... | 25 | 24 | 19 | 15 | ... | 24 | 24 |
| (d) Pigs—Breed, condition, etc. ... ... | 20 | 18 | 19 | 14 | 15 | 15 | 12 |
| 3. PASTURE AND FODDER CROPS—(100 points). | | | | | | | |
| (a) Pasture ... ... ... ... ... | 60 | 53 | 44 | 45 | 48 | 48 | 43 |
| (b) Fodder Crops ... ... ... ... | 40 | 31 | 38 | 30 | 33 | 30 | 27 |
| 4. FODDER CONSERVATION—(150 points.) | | | | | | | |
| (a) Silage :— | | | | | | | |
| Succulency ... ... ... ... | 20 | 18 | ... | 17 | 19 | 18 | 17 |
| Mixture ... ... ... ... | 20 | 18 | 63 | 18 | 17 | 17 | 18 |
| Type of Silage ... ... ... | 10 | 8 | ... | 8 | 8 | 9 | 8 |
| Percentage Waste ... ... ... | 20 | 18 | ... | 18 | 18 | 17 | 17 |
| (b) Hay :— | | | | | | | |
| Mixture ... ... ... ... | 20 | 19 | 19 | 19 | 19 | 19 | 18 |
| Condition ... ... ... ... | 20 | 17 | 17 | 17 | 18 | 18 | 17 |
| (c) Amount of Fodder conserved per head | 20 | 20 | 20 | 20 | 20 | 20 | 19 |
| (d) General Lay-out for convenience in feeding ... ... ... ... | 20 | 14 | 10 | 10 | 16 | 10 | 11 |
| 5. UTILISATION OF SEPARATED MILK FOR PIGS, POULTRY, ETC.—(25 points.) | | | | | | | |
| (a) Pigs ... ... ... ... ... | 20<br>5 | 20 | 19 | 15 | 17 | 16 | 14 |
| 6. BUTTER FAT PRODUCTION—(50 points.) | 50 | 35 | 34 | 50 | 37 | 30 | 21 |
| Total ... ... ... | 500 | 425 | 389 | 382 | 377 | 375 | 341 |

## LESSONS FROM THE COMPETITION.

During the two years that the competition has been conducted, no less than 127 farms have been carefully judged, practically every phase of operations being scrutinised by officers of the Dairy Branch, and a great deal of reliable and valuable information has been gained in this manner.

### 1.—FARM MANAGEMENT.

As was noted last year, the lay-out of many farms in the competition indicate that development has not proceeded along any well conceived plan, but fences, drains, etc., have been erected or dug as the needs of the moment dictated. Especially is this the case in the older established farms.

It is encouraging to note, however, that as the necessity for smaller paddocks is being realised, there is a very definite swing to good farm planning, generally the paddocks being offset on either side of a central race.

A distinct improvement in the records kept by farmers has been noticed, where the same farmers entered the competition for the two years. A dairy farm should be essentially a mixed farm, embracing the production of butter fat, pigs and poultry, with perhaps cropping as a useful *but limited* sideline depending on the bent of the particular owner.

There is a tendency to regard the only income from a dairy farm as that from butter fat, while in fact, it should be only the main item, in a varied source of revenue.

It is most important therefore that records kept should be of such a nature as will show the expenditure and receipts in each department. A very marked interest was evinced in grade herd recording, and the farms where daily or weekly records of milk production are available is a distinct increase on those for last year.

Illustration 6.

Good management on Mr. S. F. Russell's Farm. Manure is removed daily and carted to fields weekly. Phosphatic lick always available in sheltered bin.

## 2.—DAIRY HERD.

The summer just completed, 1932-33, has been an unusually dry one, yet stock throughout the dairy districts have been maintained generally in good condition, particularly so on the farms of competitors. This has been due almost entirely to more adequate conservation of fodder.

Competitors in all districts have now developed herds approaching strong breed characteristics of the particular type to which they have been grading up by the *continued* use of pure bred bulls of the *same breed.* This in great part may be ascribed to the departmental policy of supplying definite breeds of bulls to certain districts, known popularly as the "Zone System."

The 80 bulls in use in the herds of competitors may be classified as follows:—

TABLE 8.—HERD BULLS IN USE.

| | Pure Bred *ex* tested Dams. | Pure Bred. | Grade. | Total. | Percentage. |
|---|---|---|---|---|---|
| Jersey ... ... ... ... ... | 35 | 17 | 1 | 53 | 66 |
| Guernsey ... ... ... ... | 11 | 2 | 1 | 14 | 18 |
| Milking Shorthorn ... ... ... | 2 | 7 | ... | 9 | 11 |
| Ayrshire ... ... ... ... | 3 | 1 | ... | 4 | 5 |

For the season 1931-32 of the bulls owned by competitors 91 per cent. were pure bred, while for this season the percentage is 98 per cent.

This is a result which should afford serious room for thought to those dairy farmers who do not own pure bred bulls or ex-tested dams, particularly in view of the good average yields of the cows in the herds entered in the competition. (See below.)

## BUTTER FAT PRODUCTION.

A number of herds entered for the competition gave remarkably high average productions, and these yields err on the side of conservatism, as yields were in every instance calculated from the actual butter factory receipts.

In each zone several herds are of outstanding merit, the higher yields being due not to greater quality of the cows, but to careful and efficient management and feeding. The following individual herd averages are a credit to the owners concerned, and are all over 250 lbs. butter fat per cow.

| | No. of cows. | Average Production. lbs. fat. |
|---|---|---|
| H. Eddy, Margaret River ... ... ... | 16 | 310 |
| P. Rose, Burekup ... ... ... ... | 64 | 281 |
| S. Smith, Margaret River ... ... ... | 12 | 275 |
| A. Miller, Forest Grove ... ... ... | 23 | 258 |
| H. C. Barnsby, Pemberton ... ... ... | 18 | 257 |
| E. C. Melville, Wonnerup ... ... ... | 23 | 251 |

The average production of the cows in all zones is shown in the following table:—

TABLE 9.—AVERAGE PRODUCTION PER COW IN EACH ZONE—TOGETHER WITH THE AVERAGE OF TOP HERD.

| Zone. | No. of Cows. | Average Cows in Herd. | Average Butter Fat per Cow. |
|---|---|---|---|
| 1. Harvey ... ... ... ... ... | 190 | 31·7 | 165·6 |
| S. F. Russell ... ... ... ... ... | ... | 30·0 | 210·1 |
| 2. Bunbury ... ... ... ... ... | 380 | 42·2 | 229·2 |
| P. Rose ... ... ... ... ... | ... | 64·0 | 280·8 |
| 3. Margaret River ... ... ... ... | 452 | 29·6 | 188·6 |
| H. Eddy ... ... ... ... ... | ... | 16·0 | 310·4 |
| 4. Bridgetown ... ... ... ... ... | 186 | 23·3 | 205·3 |
| E. E. Kendall ... ... ... ... | ... | 27·0 | 246·4 |
| 5. Manjimup ... ... ... ... ... | 209 | 23·2 | 198·5 |
| H. C. Barnsby ... ... ... ... | ... | 18·0 | 257·2 |
| 7. Denmark ... ... ... ... ... | 114 | 19·0 | 221·5 |
| Bayley Bros. ... ... ... ... ... | ... | 26·0 | 243·5 |
| Average all zones ... ... ... | 1,531 | 25·5 | 201·5 |

In view of the fact that the average production of all cows in the competition numbering 1,531 was 201. 5lbs. of butter fat, it is reasonable to assume that the average production of cows in the dairy belt is exceedingly higher than the State average given in Statistics, approximately 120 lbs. The results obtained in the 1931-32 competition corroborate this assumption, and these results taken together with other information available, points to an average production in the South-West of approximately 180 lbs. per cow.

It is significant in Table 9 that the lowest average productions are found in Zone 1, in which all competitors except one were suppliers of whole milk to the metropolis. This necessitates keeping production at a constant figure, and generally

requires a larger number of cows in milk during the summer months than during the flush of the year. This, of course, is an added expense to the whole milk producer.

Illustration 7.

Mr. P. Rose's Herd of Pedigreed Jersey Cows, "Yeeralla," Burekup.
Average production of 64 cows: 281 lbs. butter fat.

## BUTTER FAT PER ACRE.

The average production of butter fat per acre, which has been remarkably consistent during the two competitions, provides a valuable index to the revenue-producing capacity of the average farm, and also is a reliable guide to the most economical size for a dairy farm.

TABLE 10.—AVERAGE PRODUCTION OF BUTTER FAT PER ACRE IN EACH ZONE COMPARED WITH THAT OF LEADING COMPETITORS.

| Zone. | Acres devoted to Dairying per Farm. | Average No. of Cows per herd. | Butter Fat per Acre. | |
|---|---|---|---|---|
| | | | 1932–33. | 1931–32. |
| 1. Harvey Average ... ... ... ... | 150·7 | 31·7 | 34·8 | 53·4 |
| S. F. Russell ... ... ... ... | 115 | 30·0 | 55·0 | ... |
| 2. Bunbury Average ... ... ... ... | 207·5 | 42·2 | 46·6 | 50·4 |
| H. Noon ... ... ... ... ... | 90 | 21 | 48·3 | ... |
| 3. Margaret River Average ... ... ... | 88·8 | 20·6 | 43·6 | 37·9 |
| C. H. Ironmonger ... ... ... ... | 110 | 23 | 49·0 | ... |
| 4. Bridgetown Average ... ... ... | 117·4 | 23·3 | 40·7 | 35·1 |
| A. Hayward ... ... ... ... | 80·0 | 19·0 | 59·7 | ... |
| 5. Pemberton Average ... ... ... | 118·1 | 23·2 | 38·8 | 35·5 |
| H. C. Barnsby ... ... ... ... | 82·0 | 18·0 | 56·5 | ... |
| 7. Denmark Average ... ... ... ... | 85·1 | 19·0 | 49·4 | 45·4 |
| Barley Bros. ... ... ... ... | 115 | 26·0 | 55·0 | ... |
| Average all zones ... ... ... ... | 120·6 | 25·5 | 42·6 | 43·0 |
| Average 6 leading Farms ... ... ... | 98·7 | 23·0 | 54·0 | 49·0 |

It will be seen from this table that, while there have been fluctuations in the zones in connection with the butter fat return per acre, the average figure for all farms over the two years of the competition are remarkably close, approximately 43 lbs. of butter fat per acre, while the average area on each farm actually being utilised in connection with the dairying operations is approximately 120 acres.

The six leading farms, however, returned 54 lbs. of butter fat per acre, or 11 lbs. more than the average, the average area of these farms being 98.7 acres.

In order to arrive at some estimate as to the economic size of a dairy farm under average conditions in the Dairy Belt, it is necessary to have some information regarding the carrying capacity of the land. Table 11 sets out the acres of land utilised per milking cow in each zone, both for 1931-32 and 1932-33.

TABLE 11.—ACRES UTILISED PER MILKING COW.

| Zone. | Average No. of Cows in Herd. | | Acres devoted to Dairying. | | Acres per Cow. | |
|---|---|---|---|---|---|---|
| | 1932-33. | 1931-32. | 1932-33. | 1931-32. | 1932-33. | 1931-32. |
| 1. Harvey ... ... | 31·7 | 31·7 | 150·7 | 138·9 | 4·8 | 4·38 |
| 2. Bunbury ... ... | 42·2 | 43·5 | 207·5 | 247·7 | 4·6 | 5·10 |
| 3. Margaret River ... | 20·6 | 19 | 88·8 | 81·5 | 4·3 | 4·28 |
| 4. Bridgetown ... ... | 23·3 | 17·6 | 117·4 | 96·1 | 4·4 | 5·47 |
| 5. Manjimup ... ... | 23·2 | 17·1 | 118·1 | 92·4 | 5·1 | 5·43 |
| 7. Denmark ... ... | 19 | 13·7 | 85·1 | 57·4 | 4·5 | 4·19 |
| Average all zones ... | 25·5 | 23·7 | 120·6 | 119·0 | 4·7 | 4·91 |

Table 11 indicates that while on the average the individual herds have increased, this increase has been accomplished by bringing a greater area into production, and not through more intensive cow carrying capacity per acre.

Remembering that competitors represent the leading dairy farmers in the State, and, in a number of instances, the most successful financially, this fact is worth special attention.

The two years' results indicate that on the average unirrigated farm approximately five acres is required per cow, which includes also yearlings, calves, and other stock which would be associated with a milking cow—this is usually referred to as a cow unit.

If, therefore, it is considered that a herd of 20 cows is necessary to maintain a family in comfort and meet all liabilities, then not less than 100 acres would be required, and, under average conditions, a 100-acre unirrigated farm would be fully stocked with a herd of 20 milking cows.

## PIGS.

The majority of competitors were paying attention to the breeding of pigs, though with the low prices that have ruled during the last 12 months, the number of breeding sows have been reduced to a minimum. 83 per cent. of farmers owned one or more breeding sows.

Table 12 shows that the Berkshire and Tamworth breeds and their crosses are the pigs in most favour.

TABLE 12.—BREEDS OF PIGS OWNED BY COMPETITORS.

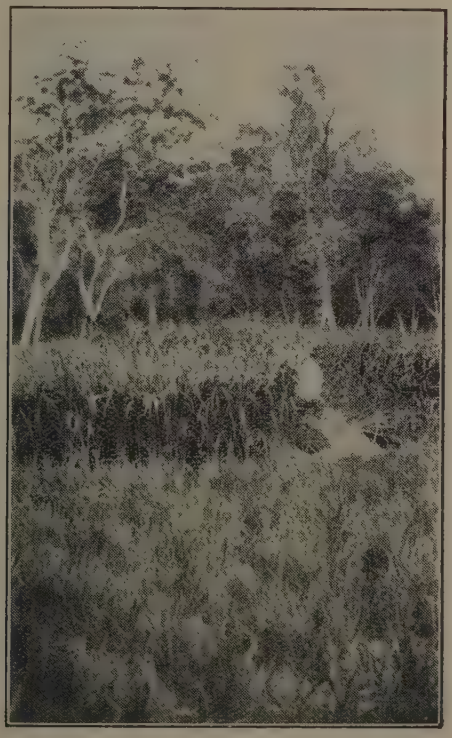
| Number of Sows. | Per cent. | Breed of Sows. |
|---|---|---|
| 70 | 49 | Berkshire |
| 55 | 38 | Tamworth-Berkshire |
| 6 | 4 | Middle White |
| 4 | 3 | Middle White-Berkshire |
| 2 | 1 | Large White |
| 7 | 5 | Other Breeds |
| Total ... 144 | 100 | |

Table 13.—COMPARISON OF NUMBER SOWS TO COWS.

| Zone. | No. of Cows. | No. of Sows. | No. of Sows to Cows. |
|---|---|---|---|
| 1. Harvey ... ... ... ... | 190 | 13 | 1 : 14·6 |
| 2. Bunbury ... ... ... ... | 380 | 38 | 1 : 10·0 |
| 3. Margaret River ... ... ... | 452 | 47 | 1 : 9·6 |
| 4. Bridgetown ... ... ... ... | 186 | 18 | 1 : 10·3 |
| 5. Manjimup ... ... ... ... | 209 | 18 | 1 : 11·6 |
| 7. Denmark ... ... ... ... | 114 | 10 | 1 : 11·4 |
| All Zones— | | | |
| 1932 33 ... ... ... ... | 1,531 | 144 | 1 : 10·7 |
| 1931-32 ... ... ... ... | 950 | 141 | 1 : 6·7 |

The very serious falling off in the number of sows in comparison with cows will be noticed, the number being reduced from 1 sow to 6.7 cows to as low as 1 sow to 10.7 cows. This is in great part due to the high cost of marketing of bacon or pork pigs from such areas as Busselton southwards and Manjimup southwards, the marketing charges being a large percentage of the carcase value at the low prices ruling.

**Illustration 8.**



A prolific crop of Millet.
Mr. S. Gray, Manjimup, 1933.

Although the prices ruling for pigs have been low, by avoiding the purchase of concentrates as far as possible, and by the growing of such fodders as maize,

peas, beans, barley, etc., a number of competitors demonstrated that pigs can still be reared at a profit. Mr. H. C. Barnsby showed particularly high returns, averaging £3 per cow nett profit from pigs.

The number of pigs reared must be dependent in part on the number of calves reared. Interesting information on this point was collected by Mr. M. Cullity, who judges Zones 2, 4, and 5, and is shown in Table 14.

TABLE 14.—CALVES REARED AND PIGS FATTENED PER COW.

| Zone. | Cows. | Calves reared. | Pigs fattened. | Total calves and Pigs. | Pigs and calves fed per Cow. |
|---|---|---|---|---|---|
| 2. Bunbury ... ... | 380 | 272 | 631 | 903 | 2·4 |
| H. Noon ... ... | 21 | 5 | 65 | 70 | 3·4 |
| 4. Bridgetown ... ... | 136 | 99 | 195 | 294 | 1·6 |
| F. O. Nelson ... ... | 24 | 17 | 55 | 72 | 3·0 |
| 5. Manjimup ... ... | 209 | 85 | 272 | 357 | 1·7 |
| H. C. Barnsby ... | 18 | 13 | 69 | 82 | 4·5 |

Table 14 shows that in the newer areas the carrying capacity per cow of calves reared or pigs fattened can be considerably increased. Mr. H. C. Barnsby is to be specially complimented on his efficient utilisation of skim milk. Mr. Noon, either by design or by mischance, was unable to rear a full quota of calves, but made up for this by utilising the skim milk available for rearing and fattening pigs. The low average figure for Zones 4 and 5, in comparison with the average for Zone 2, indicates that efficient utilisation of skim milk is a factor in the farm profits that needs careful watching.

Illustration 9.

Elephant Grass grown by S. F. Russell, Serpentine.
A promising summer fodder.

4. *Pasture and Fodder Crops.*

While on almost every farm efforts are being made in the direction of developing permanent pasture, with a view primarily of reducing labour, it must be admitted that, except on favoured spots or with irrigation, little advance has yet been made, other than on experimental areas.

The necessity for the provision of summer fodder crops or of silage to be fed during the summer months is as great as ever, and may be considered essential.

The area of each farm devoted to summer cropping is still very small, and the results in many cases are disappointing.

Heavy applications of expensive mixed fertilisers often are applied with poor results. Maize and fodder crop trials have shown that heavy applications of fertilisers are wasted unless the ground has been thoroughly cultivated. This latter operation has been the limiting factor, and imperfect aeration of the soil.

Land that is waterlogged during winter is unsuitable for the growing of summer crops. Better results are obtained on well cultivated land at a higher elevation, the thorough cultivation conserving the moisture necessary for the summer crops. This is demonstrated by the results obtained in Zone 6, along the Great Southern Railway, with the growing of Millet and Sudan Grass.

With good cultivation 3 cwts. of superphosphate and ammonia No. 2 should be a sufficient and economic dressing for summer fodder crops.

TABLE 15.—ACREAGE OF GREEN FODDER PER COW.

| Zone. | Summer Fodders. | Acres sown per Cow. |
|---|---|---|
| | acres. | |
| 1. Harvey ... ... ... ... | 36·5 | 0·19 |
| 2. Bunbury ... ... ... ... | 15·75 | 0·04 |
| 3. Margaret River ... ... ... | 66·5 | 0·14 |
| 4. Bridgetown ... ... ... | 5·0 | 0·02 |
| 5. Manjimup ... ... ... | 28·75 | 0·14 |
| 7. Denmark ... ... ... ... | 43·5 | 0·38 |
| Total ... ... ... | 196·0 | 0·127 |
| 6. Narrogin ... ... ... ... | 165·0 | 1·56 |

Zones 1—5 and 7 enjoy 30–60 inches of rainfall; zone 6 only receives 17–25 inches.

Table 15 shows that, except in the comparatively dry area in Zone 6, the acreage of summer fodders sown per cow is negligible. It may be reasoned that, in the dairying districts of the wetter South-West, silage is made in large quantities, and can take the place of summer crops which are expensive in labour.

This, however, is not borne out by the facts, as is shown in Table 16, which sets out the total tonnage of conserved fodder per cow, which, although an increase over last year, is still short of what is considered desirable.

TABLE 16.—TOTAL CONSERVED FODDER PER COW.

| | Cows. | Hay. | Silage. | Reserve per Cow. | | Reserve per Cow calculated as Hay. |
|---|---|---|---|---|---|---|
| | | | | Hay. | Silage. | |
| | | tons. | tons. | | | |
| Zone 1 Average ... ... ... | 190 | 175 | 192 | 0·92 | 1·00 | 1·25 |
| J. H. W. Masters ... ... ... | 30 | 50 | 70 | 1·66 | 2·33 | 2·43 |
| Zone 2 ... ... ... ... ... | 380 | 388 | 192 | 1·02 | 0·50 | 1·19 |
| J. Hearman ... ... ... ... | 15 | 32 | 36 | 2·13 | 2·40 | 3·93 |
| Zone 3 ... ... ... ... ... | 452 | 623 | 519 | 1·38 | 1·14 | 1·75 |
| C. H. Ironmonger ... ... ... | 23 | 45 | 80 | 1·96 | 3·48 | 3·15 |
| Zone 4 ... ... ... ... ... | 186 | 179 | 152 | 0·94 | 0·81 | 1·25 |
| H. E. Kendal ... ... ... | 27 | 60 | 20 | 2·22 | 0·74 | 2·47 |
| Zone 5 ... ... ... ... ... | 209 | 328 | 479 | 1·58 | 2·29 | 2·37 |
| G. F. Combs ... ... ... ... | 15 | 40 | 120 | 2·66 | 8·00 | 5·33 |
| Zone 7 ... ... ... ... ... | 114 | 241 | 250 | 2·11 | 2·20 | 2·66 |
| F. H. Smith ... ... ... ... | 12 | 51 | 40 | 4·25 | 3·33 | 5·36 |
| Average all Zones, 1932–33 ... | 1,531 | 1,854 | 1,784 | 1·21 | 1·16 | 1·60 |
| 1931–32 ... ... ... ... | 1,502 | 1,605 | 931 | 1·06 | 0·71 | 1·33 |

1 ton hay = 3 tons of silage.

Table 17 shows that competitors have paid more attention to the conservation of fodder since the first competition in 1931-32, but the average conserved per cow, *i.e.*, 1.6 tons, is still a long way below the objective set two years ago, namely, 2½ tons per cow.

It is instructive to compare the fodder conserved in the drier Zone 6 (centre at Narrogin) with that in the more favoured districts of the South-West.

TABLE 17.—FODDER CONSERVED PER COW IN WET DISTRICTS COMPARED WITH THAT IN DRY AREAS.

| Zones. | Hay. | Silage. | Total Reserve per Cow calculated as Hay. |
|---|---|---|---|
| | tons. | tons. | tons. |
| Average -All Zones in Wet Districts ... ... | 1·21 | 1·16 | 1·6 |
| Average—Zone 6 (Narrogin) ... ... ... | 2·9 | 3·3 | 4·0 |

Table 17 shows that farmers in the drier areas fully realise the necessity for fodder conservation, thereby setting a valuable lesson to all dairy farmers in the State. Such conservation also explains how it is that herds in these areas can put up the production records they do. The records of herds owned by Messrs. W. G. Burges, "Tipperary," York, S. P. Herbert, Nungarin, A. W. Padbury, Koojan, T. H. Wilding, Mokine, and Miss L. Hancock, "Juadine," will compare favourably with those not only in this State but in any State in the Commonwealth.

In view of the improvement in fodder conservation, it is interesting to examine the position in each Zone, and also the type of fodder in favour by dairymen, which is clearly set out in Table 18.

TABLE 18.—COMPARISON OF FODDER CONSERVED PER COW IN 1931-32 AND 1932-33.

| Zones. | Reserve per Cow. | | Total Reserve calculated as Hay. |
|---|---|---|---|
| | Hay. | Silage. | |
| | tons. | tons. | tons. |
| 1. Harvey—1931-32 ... ... ... ... | 0·76 | 0·24 | 0·84 |
| 1932-33 ... ... ... ... | 0·92 | 1·00 | 1·25 |
| 2. Bunbury—1931-32 ... ... ... ... | 0·40 | 0·40 | 0·53 |
| 1932-33 ... ... ... ... | 1·02 | 0·50 | 1·19 |
| 3. Margaret River—1931-32 ... ... ... | 1·12 | 0·90 | 1·42 |
| 1932-33 ... ... ... | 1·38 | 1·14 | 1·75 |
| 4. Bridgetown—1931-32 ... ... ... | 1·23 | 0·75 | 1·48 |
| 1932-33 ... ... ... | 0·94 | 0·81 | 1·25 |
| 5. Manjimup—1931-32 ... ... ... ... | 1·53 | 0·71 | 1·76 |
| 1932-33 ... ... ... ... | 1·58 | 2·29 | 2·37 |
| 7. Denmark—1931-32 ... ... ... ... | 1·62 | 0·71 | 1·85 |
| 1932-33 ... ... ... ... | 2·11 | 2·20 | 2·66 |
| Average—1931-32 ... ... | 1·06 | 0·71 | 1·33 |
| 1932-33 ... ... | 1·21 | 1·16 | 1·60 |

Table 18 shows that in all Zones, except Zone 4, there was a considerable increase in total fodder conserved.

Farmers in Zone 7 (Denmark) are to be congratulated on the improvement shown this year over the already high conservation last season, and on this being the first Zone in the South-West to average over 2½ tons per cow.

Silage generally seems to be the fodder showing the greatest increase. In all Zones but one a considerable increase in silage is noted. In Zone 2 (Bunbury), however, the increased fodder is conserved as hay, while the total conservation in this Zone is the least. Several of the larger farmers in this Zone, however, own areas of excellent summer pasture, which accounts for high average yields, although fodder conservation was low.

Illustration 10.

A well-built 40-ton silage stack. Dr. A. G. Abbott, Eastbrook. Bags of earth held in position by wire threaded through end; centre filled with earth.

The average increase in hay per cow .15 tons, or 14 per cent., while the increase of silage per cow is .45 tons, or 63 per cent.

From the point of view of the division and spread of labour on the farm, silage is undoubtedly the fodder along which increased production can be developed. One ton of hay per cow is probably the most economical quantity to conserve, the deficiency to reach 2½ tons being made up by conserving 2 to 3 tons of silage per cow, and by increasing the acreage sown to fodder crops.

## SUMMARY.

1. The division of farms so as to allow of rotational grazing is more frequently noticed, particularly on farms of small area.

2. More detailed records were available to the judges this year, specially as regards the differentiation of the revenue from the different farm activities.

3. The average production of the 1,531 cows in the competition was 201 lbs. of butter fat; there is reason to believe that the average cow in the South-West produces 180 lbs. approximately of butter fat per annum.

4. A policy of "grading-up" of herds by the use of pure bred bulls with production backing is being generally practised by competitors. Ninety-eight per cent. of the bulls owned are pure-bred.

5. The percentage of bulls in use according to breed is as follows:—

| | |
|---|---|
| Jersey .. .. .. .. | 66 per cent. |
| Guernsey .. .. .. .. | 18 per cent. |
| Milking Shorthorn .. .. .. | 11 per cent. |
| Ayrshire .. .. .. .. | 5 per cent. |
| | 100 per cent. |

6. Interest in pig-raising has decreased, the number of cows per brood sow being now 10.7 as against 6.7 for 1931-32.

7. The predominating breeds are Berkshire and Tamworth and crosses of these two. Eighty-seven per cent. of the brood sows were of these two breeds.

8. Considerable variation is found from farm to farm in the skill with which skim milk is utilised for feeding to stock. The number of pigs plus calves reared per cow varied from 4.5 to as low as 1.6.

Illustration 11.

H. C. Barnsby, Clovelly Farm, Pemberton.
Feeding Ensilage.

9. On the average dry farm the production of butter fat per acre is 43 lbs., a figure constant for the two years of the competition, and this is probably a fair average figure for most farms. The six leading farmers, however, produced 54 lbs.

per acre, the highest production being 78.4 lbs. per acre on the farm of Mr. L. L. Hargraves, Denmark.

10. The average herd in the competition numbered 25 cows, the average farm containing 121 acres.

11. In dry areas the necessity for fodder conservation is more generally realised, the conservation per cow being 4 tons, as against 1.6 tons in areas of heavier rainfall.

12. A greater production of silage is shown to be the method by which fodder reserves should be increased.

13. There is an urgent necessity for more attention to the growing of summer fodder crops. The average area sown per cow is only 1/10 acre in wet districts, while in dry districts found in Zone 6, the area planted was 1½ acres per cow. At least half an acre per cow should be the aim.

14. The use of PHOSPHATIC LICKS is essential during the summer months.

---

## THE SUPPORT OF FRUIT TREES IN HEAVY CROPPING SEASONS.

A. Flintoff, Horticultural Inspector.

At no period, for many years past, has the operation of supporting fruit-trees under normal to heavy crops appealed so strongly as during the present season.

Probably many orchardists with modernised ideas scorn the idea of introducing artificial means of support, claiming that the proper training of the tree obviates such measures. Nevertheless there are numbers of growers of another school of thought, and even should their ideas not exactly harmonise with the actual conditions of the fruit trees under their control, are believers in assisting any fruit tree to bear up under the weight of fruit due, in a measure, to modern achievement. Quite irrespective of what they believe, some orchardists are compelled, rather than risk serious and permanent injury to their trees, to assist them by artificial means to bear the heavy crop which nature, aided by their skill, has produced.

An extraordinary burst of heat visited the State early in February of this year (1933), causing much damage to fruit, particularly the apple crop. The harm done was accentuated by, in the case of heavily laden limbs, the sun's rays reaching many fruits that were, earlier, protected by leaves. The limbs referred to bent under the increasing weight of fruit, thereby exposing new surfaces to the heat of the sun. Particularly was this the case with varieties not normally strong limbed as Jonathan and Cleopatra. Stronger growing trees, such as Dunn's Favourite and Rokewood, have the advantage over the first-mentioned varieties in that the angle of deflection is not so pronounced in the limbs under heavy crops, the fruit being, thereby, more or less protected.

In arriving at a solution of the most economical system of support, combined of course with efficiency, orchardists the world over have used their inventive faculty to overcome the natural tendency of fruit-tree limbs bending to such an extent as to hamper work and be in danger of breaking or exposing the fruit to the abnormal heat of the sun. As a consequence we find many styles of tree

supports in use, the most common, perhaps, being the use of forked props. Other methods used include cross wiring, girdling, centre poles plus wire or rope ties. The latter is termed the maypole system, because of the appearance of the wires or ropes after attachment to the top of pole and to points on the limbs at a lower plane. Let us consider the relative merits of some of the systems in vogue.

*Propping with forked sticks.*—This involves the labour of procuring odd length poles to suit individual requirements. In many populated centres, to obtain sufficient suitable props from time to time is a serious problem, for it is admitted that light, sappy poles do not last for many seasons and need renewal. Should a good supply be available the work of distributing and placing is considerable.

The advantages may be summed up as follows:—Cheapness of material where such is abundant and labour cheap. The saving of trees and fruit by keeping limbs in a normal position.

*Disadvantages.*—Cost of material where long distances are necessary for procuring props; inconvenience in cultivating, carting, etc.; extra work entailed in removing and stacking props for another season; renewal of props at more or less frequent intervals; damage to trees when, as often happens, props fall during windy periods.

*Cross ties.*—This is a system of tying wire or rope from one limb to another, through and across the tree. A central ring is often used, with the ties radiating to the limbs, as this effects a saving in wire.

The advantages of this system include cheapness of material, reasonable permanency, and ease of fixing.

Disadvantages are, cutting into the bark at the point of contact unless suitable "pads" are used to counteract the heavy pull occasioned owing to the opposing limbs with their weight of fruit exercising an extra strain at each terminal of the wire. A frequent fault of this method is due to nature failing to provide a balanced tree, *i.e.*, equal straight limbs on all sides. It will be conceded that a fair percentage of unbalanced trees exist in most orchards. In consequence one side of the tree is stronger in growth than the other and, as the extra weight of the strong limbs and their fruits weigh down, the weaker branches give way, the result being either limbs broken or so far pulled across to the centre that the last stage of the tree is worse than the first. A further difficulty occurs when spraying or pruning, the permanent wires interfering with the most economic working.

*Girdling.*—In this operation a rope or wire encircles the tree at a point up the limbs considered suitable to the occasion. In large trees two, and sometimes three, girdles are used.

*Advantages.*—Cheapness of material, ease of application, permanency, etc. Sub-leaders may be tied up at any point to the wire.

*Disadvantages.*—Cutting into the bark at point of contact. This is not so apparent where rope is used, although instances are recorded showing that chafing of binder twine has actually destroyed the bark where twine chafed. As in the case of crossties, inconvenience when spraying or pruning. Danger of damage to the tree and fruit if the strong and heavily laden portion drags the weak side over. Unsatisfactory adjustment of the girdle in low-spreading trees, the weight of limbs, as the fruit develops, being very liable to turn the tree inside out.

*Maypole Style.*—Of reasonably recent adoption in this State, this system may claim to embody the best known principles of fruit tree protection, that is, in relation to saving from breakages and sun scald. This method consists of a stout pole

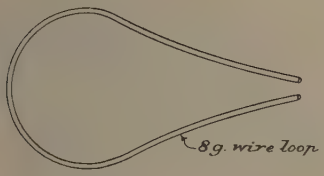



Fig 1.

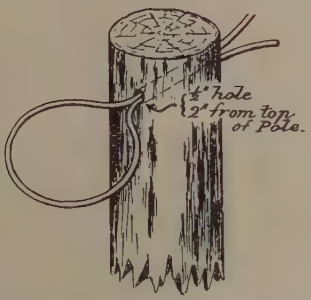



Fig 2.

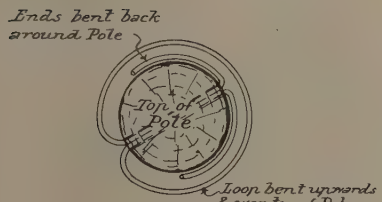



Fig 3.

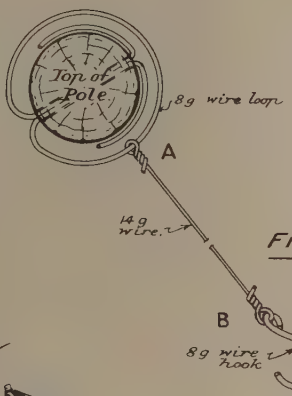
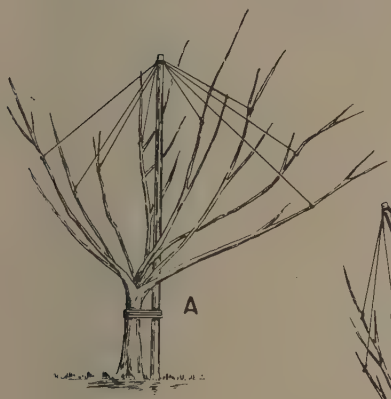



Fig 4.



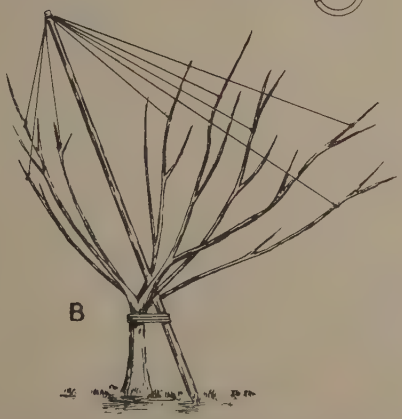




Fig 5.

(3in. to 4in. diameter at top) and wire equipment; the wires are fastened to the top of pole, to be brought then, at the other terminals, to suitable points in the limb system.

*Disadvantages.*—As with every system there are pros and cons, we may criticise the higher initial cost of the style; the eyesore, if it may be so termed, of a

stout pole, say 10ft. in height, as a permanent fixture; the complaint that the pole may become an agent for harbouring white ants, red mite, etc.

*Advantages.*—Permanency combined with efficiency; no obstruction to orchard traffic; the unbalanced tree having no danger of collapsing, as the pole takes any unequal strain; no inconvenience when spraying or pruning, as usually when half the crop has been gathered the limbs are released from the wire hooks, the wires hanging down the centre pole till again required.

Although observation leads me to favour the last-mentioned system, it would be unwise to condemn any style that may be proved by circumstances to be serviceable and economical. I would, however, advise those growers contemplating any systematic treatment in protection of their fruit-trees to consider the initial cost commensurate with efficiency, the average annual cost covering a term of, say, ten years, assuming that period to be the life of the costliest system. If the first outlay is high, it is reasonable to expect that recurring annual cost will be low.

*Description of Maypole Style.*—Material required: Pole 8ft. to 10ft. in length, according to height of tree; No. 8G steel fencing wire (galvanised); No. 14G mild steel galvanised wire. Although redgum sapling are condemned on account of liability to decay, I find that this timber is found anywhere in fruit-growing areas. The timber is of no commercial value, and easily procurable; is straight of growth, and, if barked at once and dried, makes good poles for above-mentioned purpose. Certainly they may not last as long as jarrah, but the latter is not always easy to procure. I have seen redgum poles standing for over ten years when used in fowl runs, etc. The fact that decay may set in at the ground level does not greatly concern us, as they are only a few inches in the ground. Any waste timber, such as 3in. x 2in. scantling, may be used, or a free-splitting jarrah would be useful.

According to the timber so the size may be judged. Ordinarily a jarrah pole 3in. in diameter at top, or redgum 4 inches, would be found sufficiently strong and lasting.

Having secured the pole, the next operation consists in forming a ring or loop of wire at the top. Several methods have been tried out, and I find a simple one is to bore a hole (½-inch) 2 inches from the top; take a piece of wire about 2ft. long, bend into a wide loop as Fig. 1, pass the two ends through the hole till they project about 3in. or 4in. (Fig. 2). Then bend the ends round the pole. Then bend the loop upwards and over the end of pole, forming a rough ring around the pole (Fig. 3). Stapling or nailing of a ring of wire is not entirely satisfactory owing to the frequency of splitting where staple penetrates. I have found the method shown cheap and satisfactory.

Now take a length of the smaller No. 14 gauge galvanised wire and attach one end to the ring as at A, Fig. 4; at the other extremity attach a No. 8 wire hook, as at B, Fig. 4. This, obviously, is to hold the limb. The hook remains open and, being of stout steel wire, will not spread with reasonable use. The open hook is used so that, at an instant, it may be detached from the limb and either moved to a fresh position or left hanging until wanted. If cutting of bark is feared, a small pad of bagging, etc., can be placed between the limb and the hook.

The 14 or 16 gauge mild steel wire is recommended to save expense, as there is approximately twice the length in a cwt. of the thinner wire as is found in No. 8 gauge. There is no objection to using No. 8 right through, which would obviate making separate hooks. The advantage of an open hook is found on occasions when, for instance, the crop is thinned during harvest, and the limbs may be quickly released and pulled down to facilitate picking. Pruning is also made easier

when limbs are released. The same may be said in regard to spraying. The wires may be fixed to the top ring before erecting the pole, the loose ends being temporarily fastened to the pole.

To avoid any danger from the use of redgum poles the lower ends may be dipped in wood-preserving oil or hot tar.

Difficulty is sometimes encountered in propping a very much one-sided tree, and the pole has been firmly tied to the tree trunk to prevent the heavily laden limbs from pulling the pole over, as at A, Fig. 5. The weakness of this adjustment lies in the fact that a heavy strain is put on the pole at the point A, which may break if weakened with age. Although all poles require tying to the trunk until the weight is more or less evenly distributed, the correct method of placing them on unbalanced trees is shown at B, Fig. 5. Admittedly this is not picturesque, but will be found to take the strain with little fear of breaking at the point referred to.

---

## EXPORT AND BREEDING.

A. C. Jenyns, Poultry Adviser.

The egg export season is now at hand, and the results of last season's breeding will be tested as to its improvement or otherwise by the egg producing qualities of the young stock. With regard to egg size, the basis of quality or grade should be the 15 lb. export pack, viz., eggs from 1⅞ to 2⅛ ounces, giving an *average of* 2 *ounces* in weight.

At this stage the farmer should be able, by noting the quantity of eggs fit for the 15 lb. (and larger) packs, to determine whether his last year's mating had brought an improved output and a better egg size.

It must be remembered that, though there is a lower weight pack exported, this is no reason for thinking that getting rid of the small eggs overseas is any excuse for laxity in breeding for a 2 oz. standard. It is well to look ahead to the glut which follows the export season. It is then the producer of small eggs becomes a menace not to himself but to the *Industry*. One low-priced grade of egg on the market in large quantities is going to have a lowering influence on all the grades exposed for sale. Another point to keep under notice is that, as production increases, cool store requirements decrease, thereby closing that avenue of escape from the glut. The greater the production, the more early winter eggs there are available, and there is no use putting eggs in cool store to be detrimental to the early winter new laids.

These glut times are when the careless breeder, the man who breeds from any old stock that comes to hand, or because it won a prize at a show, with no idea of the stock it was bred from—whether from a good egg laying strain, or just bred for show purposes alone.

Fine feathers do not lay eggs. It is the breeding that gives results. Appearance is necessary, but not nearly so essential as a bloodline of egg production and *egg size*.

One of the main faults in breeding (and it is perhaps the most vital point in mating), is the frequent practice of incubating eggs from birds picked out of the flock at the *last moment*, mated and called a breeding pen. This is the surest method of producing a flock of lowered vitality, subject to each and every disease which may appear.

Breeders are the most important stock on the farm. On them depends the future, whether it be success or failure. They should be treated as breeders, not only when in the breeding pen, but all the time. In the moulting season these birds should have particular care, not forced through into lay, but carefully fed and handled. The moult comes just prior to breeding time, and this period should be spent in building up the stock, seeing it is well and properly fed, housed, and treated in every way as is the due of the producer of the farm stock for the future.

Birds in the moult kept in good condition (a little over fat, if anything) are going to mean pounds in pocket later. A slight increase in the bran and green feed will correct the fat condition of the stock, and they come into lay in good condition instead of having to be fed up to egg production after a hard lean period in the moult.

It must be remembered also that a lot of eggs do not mean a lot of chickens, so in feeding breeders the feeding should be for chickens (or hatchability); a few less eggs, but every egg a chicken, should be the motto.

Three or four mashes (mornings) weekly and the rest of the food grain, with an abundance of green feed, will give a wonderful return in *hatchability* and strength of germ.

This was confirmed by experiments carried out for five months during last season when over 20,000 eggs were incubated from stock fed on different rations. A maximum of chicks from the minimum of eggs was arrived at with the result as 88 per cent. hatchability for the hard feeding (as above) against 71 per cent. on soft feed.

This care and attention to breeding stock is so vital that it seems hard to understand why so little attention is paid to it, especially when faced with the fact that this season's breeders have to produce the stock from which the farm is to be carried on and restocked in two years' time. The factor of selection is in many cases well and correctly carried out, but only just at the last moment before mating.

A line of breeders is as distinct from the ordinary *laying* flock as the *stud* of any sheep or cattle breeder, for on this line depends the future of the farm. It is not just eggs which are required for profit, but eggs of size and quality.

---

*"THE JOURNAL OF AGRICULTURE"*

will be supplied free *on application* to any person in the State who is following Agricultural, Horticultural, or Viticultural pursuits, to Agricultural Societies or Associations, and to any person otherwise interested in Agriculture.

A charge of One shilling and threepence per copy will be made for the *Journal* to persons other than the foregoing, or who do not reside in the State. These applications, accompanied by the requisite amount, must be forwarded to the Director of Agriculture, Department of Agriculture, who will also receive all correspondence dealing with the conduct of the *Journal*.

Editors of Agricultural and Country papers are invited to reproduce any of the articles contained in this Journal, providing the usual acknowledgment is made.

If you are not receiving the *Journal*, which is issued quarterly, and wish to do so, please forward your name and postal address to the Director of Agriculture, Perth.

# FIELD EXPERIMENTS WITH WHEAT, 1932.

## MERREDIN EXPERIMENT FARM.

I. Thomas, Superintendent of Wheat Farms.

J. H. Langfield, Farm Manager.

In addition to the experiments published in the March issue of this Journal, the following experiments were conducted at the Merredin Experiment Farm during 1932:—

Fallow v. Non-Fallow.
Time of Ploughing.
Mulching Experiment.

The total rainfall for the year was 1,307 points, of which 1,113 points fell during the growing period (May to October). The following table shows the monthly rainfall for the year, together with the average over a period of 21 years.

| Year. | Jan. | Feb. | Mar. | Apl. | Growing Period. | | | | | | | Nov. | Dec. | Total for year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | May. | June. | July. | Aug. | Sep. | Oct. | Total. | | | |
| 1932 ... | 51 | 11 | 59 | 42 | 160 | 69 | 231 | 283 | 56 | 314 | 1,113 | ... | 31 | 1,307 |
| Avg. 21 yrs. | 52 | 54 | 116 | 82 | 136 | 185 | 190 | 152 | 90 | 85 | 838 | 43 | 52 | 1,237 |

Very little rain fell before 25th May, and consequently it was not possible to work the fallow wet before seeding and control weed growth. June was a comparatively dry month, only 69 points being recorded, but the registrations for both July and August were above the average. During September the rainfalls were scanty, only 56 points being recorded. The October rainfalls were unusually high, 314 points being recorded against the average for this month of 85 points.

The October rains, by reason of their lateness, lost much of their value except for the late plantings. As a result of these late rains, however, an excellent sample of plump grain was obtained.

The land on which these experiments were conducted originally carried salmon gum and gimlet timber, the soil being typical of such country. For some years the three-year rotation, namely, fallow, crops (chiefly wheat) and pasture has been practised.

During 1931 the land had been ploughed with a heavy disc plough to suit the requirements of the respective experiments. It was worked with a disc cultivating plough during September and again just before seeding.

### *Fallow v. Non-Fallow Experiment.*

The object of this experiment, which has been conducted since 1925, is to demonstrate the advantage of fallowing.

Two plots, each one quarter of an acre in area, were set apart for the experiment, one of which was ploughed four inches deep in June, 1931, the other plot (non-fallow) being ploughed after rain late in May and disc cultivated immediately prior to seeding.

The results obtained are as follow:—

FALLOW *v.* NON FALLOW EXPERIMENT.

Planted on 3rd June, 1932. Variety—Totadgin. 22 % Superphosphate—112lb. per acre. Seed—45lb. per acre.

| Treatment. | Average Yields per acre. 1932. | Percentage Yields. 1932. | Averge Yields per acre. 1925–32. | Percentage Yields. 1925–32. |
|---|---|---|---|---|
| | bus. lb. | | bus. lb. | |
| Fallow ... ... ... | 40 0 | 100 | 23 54 | 100 |
| Non Fallow ... ... | 26 56 | 67 | 17 30 | 73 |

These results show definitely that decreased wheat yields can be expected when the land has not been fallowed.

The percentage results since 1925 illustrate the advantage of fallowing for the wheat crop.

| Year. | Fallowed. | Unfallowed. |
|---|---|---|
| | % | % |
| 1925 ... ... ... | 100 ... | 38 |
| 1926 ... ... ... | 100 ... | 58 |
| 1927 ... ... ... | 100 ... | 87 |
| 1928 ... ... ... | 100 ... | 44 |
| 1929 ... ... ... | 100 ... | 72 |
| 1930 ... ... ... | 100 ... | 104 |
| 1931 ... ... ... | 100 ... | 88 |
| 1932 ... ... ... | 100 ... | 67 |
| Average ... ... | 100 | 73 |

*Time of Ploughing Experiment.*

A Time of Ploughing Experiment has been conducted at this farm for the past nine years, with the object of determining the effects of early and late winter fallowing on the resultant crops grown on heavy land. For six years (1924-29) the experiment consisted of two plots, each half an acre in area, one representing early winter fallow, being ploughed during the first week of June, and the other late winter fallow, ploughed the last week of August.

The average results over this period are distinctly in favour of the early winter fallow.

| Time of Ploughing. | Average Yield per acre, 1924–29. | Percentage Yields, 1924–29. |
|---|---|---|
| | bus. lb. | % |
| First week of June ... ... | 18 46 | 100 |
| Last week of August ... ... | 14 55 | 80 |

In 1930 the experiment was slightly modified, a third plot being included, the times of ploughing being respectively mid-June, mid-July, and mid-August, and the area of the plots each one quarter of an acre.

After ploughing all plots were springtyne cultivated in September, harrowed in April, and disc cultivated immediately prior to seeding.

The results obtained are as follow:—

TIME FOR PLOUGHING EXPERIMENT.

Planted on 3rd June, 1932. Variety—Totadgin. 22 % Superphosphate—112lbs. per acre. Seed—45lbs. per acre.

| Time of Ploughing. | Average Yields per acre. 1932. | Percentage Yields. 1932. | Average Yields per acre. 1930–32. | Percentage Yields. 1930–32. |
|---|---|---|---|---|
| | bus. lb. | % | bus. lb. | % |
| Mid July ... ... ... | 34 46 | 86 | 26 32 | 87 |
| Mid June ... ... ... | 40 4 | 100 | 30 28 | 100 |
| Mid August ... ... | 22 8 | 55 | 19 58 | 66 |

The results emphasise the advantage of early ploughing.

*Mulching Experiment.*

The object of this experiment, which has been conducted since 1915, is to determine to what extent and under what conditions the cultivation of winter fallowed land is profitable during the spring and summer.

To meet the requirements of the experiment three plots were treated, as follows:—

*Plot* 1.—Cultivated during spring, again when required during summer after 25 points of rain or over, and again prior to seeding.

*Plot* 2.—Cultivated during spring and prior to seeding (ordinary fallow).

*Plot* 3.—Cultivated prior to seeding only (neglected fallow).

The land was ploughed to a depth of four inches during June, 1931. Plots 1 and 2 were springtyne cultivated in September, and Plot 2 received additional cultivations after the rain in January and again at the end of March. All plots were disc cultivated during early April.

The results obtained are set out below.

MULCHING EXPERIMENT.

Planted on 14th May, 1932. Variety—Totadgin. 22 % Superphosphate—112 lbs. per acre. Seed—45 lbs. per acre.

| Treatment. | Computed Yields per Acre. | | | | | Average Yields per acre, 1932. | Percentage Yields, 1932. | Average Yields per acre, 1915-32* | Percentage Yields, 1915-32.* |
|---|---|---|---|---|---|---|---|---|---|
| | Sec. 1. | Sec. 2. | Sec. 3. | Sec. 4. | Sec. 5. | | | | |
| | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | % | bus. lbs. | % |
| Cultivated in Spring; during Summer; after rain & before planting | 27 40 | 21 10 | 19 40 | 27 0 | 26 20 | 24 22 | 95 | 21 52 | 101 |
| Cultivated in Spring and before planting | 25 40 | 27 50 | 24 0 | 24 50 | 26 10 | 25 42 | 100 | 21 36 | 100 |
| Cultivated before planting only | 23 20 | 21 20 | 26 50 | 24 20 | 21 40 | 23 30 | 91 | 20 25 | 94 |

* Exclusive of 1931.

This year's results indicate an advantage in favour of the ordinary fallow.

The average results obtained over a period, extending back to 1915, indicate that the general practice should be to cultivate the fallow during spring and again prior to seeding, and where the ground is weedy, this cultivation should be supplemented by additional cultivations after rain during the summer months.

# FIELD EXPERIMENTS WITH WHEAT, 1932.

## SALMON GUMS EXPERIMENT FARM.

I. THOMAS, Superintendent of Wheat Farms.

L. G. SENIOR, Farm Manager.

In addition to the experiments published in the March issue of this Journal, the following experiments were conducted at the Salmon Gums Experiment Farm during 1932:—

Depth of Ploughing.

Time of Ploughing.

The following are the monthly rainfalls as recorded at the farm during 1932, together with the averages for the seven years the farm has been established:—

| Year. | Jan. | Feb. | Mar. | Apl. | Growing Period. | | | | | | | Nov. | Dec. | Total for year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | May. | June. | July. | Aug. | Sep. | Oct. | Total. | | | |
| 1932 ... | 49 | *Nil* | 90 | 87 | 78 | 164 | 144 | 210 | 79 | 330 | 1,004 | 26 | 49 | 1,307 |
| Avg. 7 yrs. | 31 | 51 | 158 | 93 | 142 | 137 | 145 | 208 | 79 | 133 | 844 | 47 | 61 | 1,285 |

The total rainfall for the year was 1,307 points, being slightly over the average, while that for the growing period was 1,004 points, 160 points above the average for the same period.

Very little rain, however, fell early in the year. The latter half of April and almost the whole of May were unusually deficient of rain. The only falls of value registered during the month of May fell on the 29th and 31st, when 37 and 36 points respectively were recorded.

The delayed seeding rains were too late to enable the fallowed land to be planted in the desired wet condition. The germination of the early sown crops was also considerably retarded.

The rainfall from June to September was about the average, but particularly heavy rains were experienced during October. These, although late, proved of considerable value, particularly to the later maturing varieties. A number of frosts were recorded during the growing period, but little or no damage to the grain occurred.

The land on which the experiments were conducted carried originally silver bark and mallee, which had been rolled down during 1926. Previous to 1932 it had grown two crops, each on fallow. During 1931 it was ploughed with a disc cultivating plough to suit the requirements of the respective experiments. It was disced two inches deep towards the end of September, and again in April. The land was rigid tyne cultivated early in May and springtyne cultivated immediately prior to planting.

### *Depth of Ploughing Experiment.*

The object of this experiment, which has been conducted for the past four years, is to determine the most economical depth to plough for the wheat crop.

Three plots, each repeated five times, were required, one ploughed to a depth of 2 inches, one to 4 inches, and one to 6 inches. The results are shown hereunder:—

DEPTH OF PLOUGHING EXPERIMENT.

Planted on 16th June, 1932. Variety—Gluyas Early. 22 % Superphosphate—112lbs. per acre. Seed—45lbs. per acre.

| Depth of Ploughing. | Computed Yields per Acre. | | | | | Average Yields per acre, 1932. | Percentage Yields, 1932. | Average Yields per acre, 1929-32. | Percentage Yields, 1929-32. |
|---|---|---|---|---|---|---|---|---|---|
| | Sec. 1. | Sec. 2. | Sec. 3. | Sec. 4. | Sec. 5. | | | | |
| | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | % | bus. lbs. | % |
| 2in. ... ... ... | 19 36 | 18 16 | 22 8 | 18 8 | 18 0 | 19 14 | 86 | 13 39 | 91 |
| 4in. ... ... ... | 24 0 | 23 20 | 22 40 | 21 52 | 19 20 | 22 14 | 100 | 15 5 | 100 |
| 6in. ... ... ... | 24 40 | 23 36 | 23 52 | 22 32 | 23 28 | 23 38 | 106 | 15 6 | 100 |

This year's results indicate an advantage in favour of the deep ploughing. The average results, obtained over a period of four years, however, indicate that there is no advantage to be gained by ploughing to a depth greater than 4 inches.

### *Time of Ploughing Experiment.*

Three objects of this experiment is to ascertain whether the time of carrying out the initial operation of fallowing, *i.e.*, ploughing, has any effect upon the yield of the resultant wheat crop.

The plots, treated in the following manner, were required:—

*Plot* 1.—Ploughed in March, 1931. (Long summer fallow.)

*Plot* 2.—Ploughed in June, 1931. (Early winter fallow.)

*Plot* 3.—Ploughed in September, 1931. (Late winter fallow.)

The results obtained from the respective plots are shown below:—

TIME OF PLOUGHING EXPERIMENT.

Planted on May 16th, 1932. Variety—Gluyas Early. 22 % Superphosphate—112lbs per acre. Seed—45lbs. per acre.

| Time of Ploughing. | Computed Yields per Acre. | | | | | Average Yields per acre, 1932. | Percentage Yields, 1932. | Average Yields per acre, 1928-32. | Percentage Yields 1928-32. |
|---|---|---|---|---|---|---|---|---|---|
| | Sec. 1. | Sec. 2. | Sec. 3. | Sec. 4. | Sec. 5. | | | | |
| | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | % | bus. lbs. | % |
| March, 1931 ... ... | 23 28 | 20 16 | 20 8 | 20 0 | 21 12 | 21 1 | 93 | 13 43 | 92 |
| June, 1931 ... ... | 23 44 | 22 24 | 21 36 | 22 8 | 22 48 | 22 32 | 100 | 14 55 | 100 |
| September, 1931 ... | 21 34 | 18 16 | 19 28 | 20 0 | 20 40 | 20 0 | 89 | 13 10 | 88 |

The results obtained this year, and the average results for the past five years, indicate that better results are obtained when the land is ploughed during the early winter months. Ploughing operations should, therefore, be commenced immediately after seeding has been completed.

# FIELD EXPERIMENTS WITH WHEAT, 1932.

## CHAPMAN EXPERIMENT FARM.

I. THOMAS, Superintendent of Wheat Farms.
F. L. SHIER, Farm Manager.

In addition to those experiments published in the March issue of this Journal, a Fallow v. Non-fallow Experiment was also conducted at the Chapman Experiment Farm during 1932.

The following table shows the monthly rainfalls, as recorded at the farm during 1932, together with the averages over the past 27 years:—

| Year. | Jan. | Feb. | Mar. | Apl. | Growing Period. | | | | | | | Nov. | Dec. | Total for year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | May. | June. | July. | Aug. | Sep. | Oct. | Total. | | | |
| 1932 ... | 118 | *Nil* | 61 | 113 | 356 | 182 | 366 | 556 | 112 | 144 | 1,716 | 3 | 33 | 2,044 |
| Avg. 27 yrs. | 28 | 44 | 62 | 47 | 247 | 421 | 401 | 275 | 162 | 97 | 1,603 | 31 | 26 | 1,841 |

The season promised to open well with early April rains, which germinated weed seeds and enabled the fallowed land to be cultivated. Following these rains, however, a dry period, lasting until towards the end of May occurred. Strong drying winds were also experienced. Ideal seeding conditions then prevailed until planting operations were completed on the 20th June. During this period further cultivations were necessary to check weed growth on the fallow.

Heavy rains were experienced during July and August, the registrations for the latter month being particularly high. Satisfactory finishing rains fell during October.

### *Fallow v. Non-Fallow Experiment.*

The object of this experiment, which has been conducted at this farm for four years, is to ascertain the comparative effect upon the yields of the resultant wheat crop, when sown on fallowed and unfallowed land.

The land on which the experiment was conducted, originally carried Jam and Wattle timber, and had been cleared for many years.

For the purpose of the experiment two sets of plots are required, the fallow plots being ploughed with a mouldboard plough during July, 1931, springtyne cultivated in September, again in April and May, and finally immediately prior to seeding, while the unfallowed plots were ploughed on 30th May, 1932.

The variety Nabawa was planted at the rate of 60 lb. per acre, and superphosphate applied at 112 lb. per acre. The fallow plots were repeated three times and the non-fallow twice.

The results obtained are as follow:—

FALLOW v. NON-FALLOW EXPERIMENT.

Planted on 4th June, 1932. Variety—Nabawa. 22 % Superphosphate—112 lbs. per acre. Seed—60 lbs. per acre.

| When Ploughed. | Computed Yields per Acre. | | | | | Average Yields per acre. 1932. | Per-centage Yields. 1932. | Average Yields per acre. 1929-32. | Per centage Yields. 1929-32. |
|---|---|---|---|---|---|---|---|---|---|
| | Sec. 1. | Sec. 2. | Sec. 3. | Sec. 4. | Sec. 5. | | | | |
| | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | % | bus. lbs. | % |
| Fallow—Ploughed July, 1931 | 15 28 | ... | 16 24 | ... | 17 28 | 16 27 | 100 | 13 33 | 100 |
| Non-Fallow—May, 1932 | ... | 14 48 | ... | 15 12 | ... | 15 0 | 91 | 11 53 | 88 |

Both in this year's results and the average results for the four years the experiment has been conducted, the fallowed plots show to advantage.

# FIELD EXPERIMENTS WITH WHEAT, 1932.

## DAMPAWAH EXPERIMENT FARM.

I. Thomas, Superintendent of Wheat Farms.
F. Gishubl, Farm Manager.

The following experiments were conducted at the Dampawah Experiment Farm during 1932 in addition to those published in the March issue of this Journal:—

Fallow v. Non-Fallow.

Time of Ploughing.

Depth of Ploughing.

Mulching Experiment.

The farm is situated 30 miles east of Perenjori, having been formerly a portion of Karara Station, on the fringe of the Lower Murchison.

The soil is a red friable loam, uniform in appearance, and was originally timbered with york gum, giant mallee, karara, and mulga scrub.

The land was cleared in 1927 and early 1928, and fallowed the same year. It was cropped in 1929 and in 1930; the stubble was utilised for grazing. During 1931 the land was ploughed with a disc cultivating plough to suit the requirements of the respective experiments. During late August and early September it was cultivated with a springtyne implement. Seeding was carried out with a combined cultivator drill.

The following table shows the rainfall registered at the farm since its establishment:—

| Year. | Jan. | Feb. | Mar. | Apl. | Growing Period. | | | | | | | Nov. | Dec. | Total for year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | May. | June. | July. | Aug. | Sep. | Oct. | Total. | | | |
| 1928 ... | * | * | * | * | 164 | 94 | 238 | 142 | 71 | 34 | 743 | 6 | 156 | * |
| 1929 ... | 17 | 229 | 64 | ... | 267 | 234 | 60 | 62 | 18 | 33 | 674 | 120 | ... | 1,095 |
| 1930 ... | ... | ... | 93 | 123 | 48 | 404 | 160 | 93 | 22 | 41 | 768 | 31 | 54 | 1,069 |
| 1931 ... | ... | 12 | 3 | 25 | 237 | 113 | 232 | 95 | 131 | 40 | 848 | 179 | 120 | 1,187 |
| 1932 ... | 49 | ... | 56 | 46 | 138 | 91 | 205 | 302 | 59 | 125 | 920 | 6 | 79 | 1,156 |

* No records.

This year the rainfall for the growing period was the highest recorded since the establishment of the farm. Despite this, however, growing conditions were not ideal, particularly for the early and midseason varieties. No satisfactory falls were received until the 28th May and, in consequence, germination was delayed until early in June. During the latter month, which was comparatively dry, several severe frosts were experienced. Both these factors further retarded the growth of the crop.

Conditions were excellent throughout July and August, but during September only 59 points of rain was registered in three falls. In addition two severe frosts adversely affected the crops, particularly the early varieties.

*Fallow v. Non-Fallow Experiment.*

The object of this experiment is to ascertain the effect upon the resulting wheat crop of planting on fallowed and unfallowed land.

For the purpose of the experiment two sets of plots were required, the fallowed plots being ploughed in June, 1931, and the unfallowed plots in April, 1932. The results are as hereunder:—

FALLOW *v.* NON-FALLOW EXPERIMENT.

Planted on 2nd May, 1932. Variety—Gluyas Early. 22 % Superphosphate—90lbs. per acre. Seed—45lbs. per acre.

| Treatment. | Computed Yields per Acre. | | | Average Yields per acre, 1932. | Percentage Yields, 1932. | Average Yields per acre, 1930-32. | Percentage Yields, 1930-32. |
|---|---|---|---|---|---|---|---|
| | Sec. 1. | Sec. 2. | Sec. 3. | | | | |
| | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | % | bus. lbs. | % |
| Fallow ... ... ... | 24 16 | 24 0 | 23 44 | 24 0 | 100 | 14 54 | 100 |
| Non-Fallow ... ... ... | 18 56 | 19 20 | 18 40 | 18 59 | 79 | 12 17 | 82 |

These results show that the yields of the wheat crop are increased when the land has been fallowed.

*Time of Ploughing Experiment.*

The object of this experiment is to ascertain whether the time of carrying out the initial operation of fallowing, *i.e.*, ploughing, has any effect upon the yield of the resulting wheat crop.

For the purpose of the experiment three plots were required:—

Plot 1.—Ploughed in April.

Plot 2.—Ploughed in June.

Plot 3.—Ploughed in August.

The results obtained are as follow:—

TIME OF PLOUGHING EXPERIMENT.

Planted on 3rd May, 1932. Variety—Gluyas Early. 22 % Superphosphate—90lbs. per acre. Seed—45 lbs. per acre.

| Time of Ploughing. | Computed Yields per Acre. | | | | | Average Yields per acre, 1932. | Percentage Yields, 1932. | Average Yields per acre, 1930-32. | Percentage Yields, 1930-32. |
|---|---|---|---|---|---|---|---|---|---|
| | Sec. 1. | Sec. 2. | Sec. 3. | Sec. 4. | Sec. 5. | | | | |
| | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | % | bus. lbs. | % |
| April, 1931 ... ... | 22 0 | 22 0 | 21 4 | 20 16 | 19 12 | 20 54 | 96 | 13 58 | 95 |
| June, 1931 ... ... | 22 48 | 22 40 | 21 12 | 22 0 | 20 32 | 21 50 | 100 | 14 40 | 100 |
| August, 1931 ... ... | 21 12 | 20 56 | 21 12 | 19 52 | 18 48 | 20 24 | 93 | 13 53 | 95 |

The results for this year and the average results obtained over the three years that the experiment has been conducted indicate that the yields are increased when the land is ploughed during the early winter months. These are in conformity with somewhat similar experiments conducted at the other experiment farms.

### *Depth of Ploughing Experiment.*

The object of this experiment is to determine the comparative effects upon the resultant wheat crop of ploughing the land to different depths.

For the purpose of the experiment three plots were required, and they were ploughed early in July, 1931, to the respective depths of 2 inches, 4 inches, and 6 inches, the whole experiment being repeated five times.

The plots were planted with a combined cultivator-drill on the 3rd May, the variety, Gluyas Early, being planted at the rate of 45 lb. per acre, and superphosphate applied at the rate of 90 lb. per acre.

The results obtained are as follow:—

DEPTH OF PLOUGHING EXPERIMENT.

Planted on 3rd May, 1932. Variety—Gluyas Early. Seed—45 lbs. per acre. Superphosphate—90 lbs. per acre

| Depth of Ploughing. | Computed Yields per Acre. | | | | | Average Yields per acre, 1932. | Percentage Yields, 1932. | Average Yields per acre, 1930-32. | Percentage Yields, 1930-32. |
|---|---|---|---|---|---|---|---|---|---|
| | Sec. 1. | Sec. 2. | Sec. 3. | Sec. 4. | Sec. 5. | | | | |
| | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | bus. lbs. | % | bus. lbs. | % |
| 2 inches ... ... | 18 0 | 18 0 | 18 24 | 18 40 | 18 32 | 18 19 | 94 | 12 52 | 94 |
| 4 inches ... ... | 19 20 | 19 36 | 20 8 | 19 28 | 18 56 | 19 30 | 100 | 13 45 | 100 |
| 6 inches ... ... | 19 36 | 19 36 | 19 44 | 19 4 | 18 56 | 19 23 | 99 | 13 43 | 100 |

The results for this year, and also the average results obtained over the period of three years that the experiment has been conducted, indicate that it is most economical to plough to a depth of 4 inches.

### *Mulching Experiment*

This experiment is conducted in order to determine to what extent the cultivation of winter fallowed land is profitable during the spring and summer months.

Three series of plots were necessary to fulfil the requirements of the experiment, and they were treated as follows:—

Plot 1.—Cultivated prior to seeding only (neglected fallow).

Plot 2.—Cultivated during spring and prior to seeding (ordinary fallow).

Plot 3.—Cultivated during spring, again when required during summer after 25 points of rain or over, and again prior to seeding, the object being to maintain a mulch throughout the fallowed period and to destroy weed growth.

All plots were ploughed during July, 1931, and subsequently received the following cultivations with a springtyne implement:—

Plot 1.—Cultivated at seeding time only.

Plot 2.—Cultivated in July, 1931, and at seeding time.

Plot 3.—Cultivated in July, September, October, November, December, and at seeding.

The results obtained are as follow:—

MULCHING EXPERIMENT.

Planted on 3rd May, 1932. Variety—Gluyas Early. Superphosphate—90 lbs. per acre.
Seed—45 lbs. per acre.

| Treatment. | Computed Yields per Acre. | | | | | | | | | | Average Yields per acre, 1932. | | Percentage Yields, 1932. | Average Yields per acre, 1929, 30, and 1932. | | Percentage Yields, 1929, 30, and 1932. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sec. 1. | | Sec. 2. | | Sec. 3. | | Sec. 4. | | Sec. 5. | | | | | | | |
| | bus. | lbs. | bus. | lbs. | bus. | lbs. | bus. | lbs. | bus. | lbs. | bus. | lbs. | % | bus. | lbs. | % |
| Cultivated before seeding only | 20 | 24 | 20 | 48 | 20 | 8 | 21 | 20 | 21 | 52 | 20 | 54 | 98 | 17 | 49 | 100 |
| Cultivated in spring and before seeding | 21 | 4 | 21 | 4 | 21 | 12 | 22 | 0 | 21 | 20 | 21 | 20 | 100 | 17 | 47 | 100 |
| Cultivated in spring during summer after rain and before seeding | 20 | 48 | 21 | 36 | 20 | 0 | 21 | 36 | 19 | 52 | 20 | 46 | 97 | 17 | 8 | 96 |

These results do not indicate that any advantage is derived from cultivating fallow during the spring or summer months at this farm. Lack of response to the spring cultivations may possibly be due to the friable nature of the soil and the fact that, being new land, there is as yet practically no weed growth.

---

## ENTOMOLOGICAL NOTES.

B. A. O'CONNOR, B.A., B.Sc. Ag.

### *Identity of White Wax Scale.*

In the "Agricultural Gazette" of New South Wales, August, 1932, Mr. E. H. Zeck pointed out that the wax scale infesting citrus in New South Wales was not, as was formerly considered, the Indian *Ceroplastes ceriferus*, but the African species *Ceroplastes destructor*. He expressed the opinion that the White Wax Scale of citrus in West Australia was probably *C. destructor*, and an examination of the scale in this State reveals that it agrees with his description of *C. destructor*. Hence, previous published references to White Wax Scale of citrus in West Australia apply to *Ceroplastes destructor*.

### *The Vine Scale and its parasite.*

The Vine Scale, *Eulecanium persicae Fabr.* (*Lecanium cymbiformis Targ., L. berberidis Sign.*) was in the early years of this century a bad pest of the grape vine, plum, pear, peach, nectarine, mulberry and apricot. About 1910, Mr. George Compere introduced a parasite which has since controlled the scale with great efficiency. The identity of this parasite was not known, though it was believed to be a species of *Aphycus*. In 1932, specimens sent to Mr. A. A. Girault of the Queensland Department of Agriculture, were identified as *Aphycus timberlakei Ishii*, originally described in 1923 from specimens which issued from a species of *Lecanium* on *Euonymus* at Nagasaki, Japan. The male is black, the female having a brown head and thorax with black and white markings, on antennae and abdomen, wings with a dark discal patch.

*The cat-louse, Trichodectes subrostratus Nitzsch.*

The first record of the occurrence of this louse in Western Australia was made on April 11, 1933, when specimens were taken on a cat at South Perth.

*Violet Aphis.*

On May 24, 1933, Mr. L. J. Newman collected some aphids from the under-sides of the leaves of violets at Claremont. These proved to be *Rhopalosiphum violae Pergande*, which has not previously been recorded from this State, or from Australia, to the writer's knowledge. This aphid is easily distinguished by the dark red colour of the abdomen and the broad black wing-veins.

*Calliphora nociva.*

In the Bulletin of Entomological Research for December, 1932, G. H. Hardy described a species of *Calliphora* under the name *Calliphora nociva*. This description appeared to fit an unnamed species of *Calliphora* occurring commonly in this State, and confirmation of this belief was forthcoming when specimens were submitted to Mr. Hardy. Data as to the distribution of this fly in Western Australia may be found in an article on the seasonal and regional incidence of Western Australian blowflies appearing in the "Journal of Agriculture," December, 1930. In this article, *Calliphora nociva* is referred to as *Calliphora* sp.

---

## THE BLOW-FLY PROBLEM.

### OFFICIAL REPORT AVAILABLE.

Copies of the first report issued by the Joint Blow-Fly Committee, appointed by the Council for Scientific and Industrial Research and the New South Wales Department of Agriculture, have now been received in Western Australia, and are obtainable at the Department of Agriculture at a cost of 1s. 6d. per copy, post free.

The report, which is edited by Dr. R. J. Tillyard, of the Division of Economic Entomology, and Dr. Seddon, Director of Veterinary Research, N.S.W., is a comprehensive statement setting out our present knowledge of the blow-fly problem as a whole and the research work already accomplished by former and present investigations in Australia. It deals comprehensively with our knowledge of strike, *i.e*, the condition produced by the presence of blow-fly maggots on the living sheep, and the flies are classified into primary and secondary flies according to their ability to initiate strike. The report is accompanied by a plate giving a reproduction in colours of the flies of economic importance in connection with the sheep problem, and it is considered that this report should enable pastoralists and farmers to determine which flies are responsible for their particular conditions. The life history and the conditions favouring propagation of the blow-fly are discussed in detail, so that the various methods by which the pest may be combated can be readily understood.

As supplies of the report in Western Australia are limited, it is suggested that early application be made to the Department of Agriculture for copies, accompanied by stamps or money order to the value of 1s. 6d.

## FALLOW COMPETITION, 1932.

### KARLGARIN AGRICULTURAL SOCIETY.

Judge: A. S. WILD, Agricultural Adviser.

Seven competitors submitted fallows for inspection in the 50-acre fallow competition conducted by this Society. Awards were made as shown in the following table:—

| Competitor. | District. | Moisture. 40 points. | Mulch. 10 points. | Freedom from Weeds. 10 points. | Consolidation of Seedbed. 20 points. | Uniformity of Preparation. 20 points. | Total. 100 points. |
|---|---|---|---|---|---|---|---|
| James, S. W. ... | Karlgarin ... | 38 | 8 | 9 | 18 | 18 | 91 |
| Medcalf ... ... | Karlgarin ... | 36 | 9 | 8 | 18 | 18 | 89 |
| Clayton, R. G. ... | North Hyden Rock | 38 | 8 | 7 | 18 | 17 | 88 |
| Marshall, H. J. | Hyden Rock ... | 37 | 8 | 8 | 18 | 17 | 88 |
| Grant, L. J. ... | Karlgarin ... | 35 | 8 | 9 | 16 | 17 | 85 |
| Green & Atkinson | North Hyden Rock | 37 | 8 | 7 | 16 | 17 | 85 |
| Trestrail, S. J. ... | Karlgarin ... | 34 | 6 | 8 | 17 | 17 | 82 |

The competition was won by Mr. S. W. James, of Karlgarin. Mr. James' fallow has been carefully prepared; the mulch was perhaps a little too fine, but the consolidation of the seed bed was satisfactory, except on portions of "snuffy" morrel soil. In addition, the fallow was very clean of weed growth.

Mr. C. W. Medcalf's fallow, which was awarded second place, lost additional points for moisture and weed growth. In other respects it was equal to the winning entry.

The rainfalls recorded from June to January, inclusive, are as follows:—

| Centre. | Fallowing Rains. | | | | Spring Rains. | | | Summer Rains. | | | | Total June-Jan. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | June. | July. | Aug. | Total. | Sept. | Oct. | Total. | Nov. | Dec. | Jan. | Total. | |
| Karlgarin ... | 96 | 254 | 290 | 640 | 127 | 277 | 404 | 5 | 9 | 38 | 52 | 1,096 |
| Sth. Hyden Rock | 108 | 244 | 210 | 562 | 73 | 278 | 351 | ... | 4 | 54 | 58 | 971 |
| Nth. Hyden Rock (Camel Peaks) | 125 | 282 | 267 | 674 | 99 | 270 | 369 | ... | ... | ? | ... | ... |

The cultural details of the competitors are summarised in the table hereunder:—

CULTURAL DETAILS.

| Competitor. | Timber. | Cleared. | Ploughed. | Implement. | Depth of Ploughing. | Condition of Land at Ploughing. | Other Cultivations. |
|---|---|---|---|---|---|---|---|
| | | | | | inches. | | |
| S. W. James ... ... | Salmon and Morrel | 1923 | April ... | Disc ... | 2½ | Dry ... ... | Rigidtyne cultivated 3in. deep late June and again late August. |
| C. W. Medcalf ... ... | Mallee, Salmon and Gimlet | 1927 | Early July ... | Disc ... | 3—4 | Wet ... ... | Springtyne cultivated 4in. deep in August; Springtyne cultivated 2in. deep in September and again in October. |
| R. G. Clayton ... ... | Salmon and Mallee | 1930 | Late June ... | Disc ... | 3 | Wet ... ... | Springtyne cultivated in September. |
| H. J. Marshall ... ... | Salmon and Gimlet | 1931 | Early June ... | Disc ... | 3 | Good ... ... | Springtyne cultivated in August; again in September, and again in October. |
| L. J. Grant ... ... | Salmon and Mallee | 1927 | July ... | Disc ... | 3—4 | Wet ... ... | Springtyne cultivated in August and again in September. |
| Green & Atkinson ... | Salmon, Gimlet Mallee and Tea-tree | 1927 | Late June ... | Disc ... | 3 | Wet ... ... | Springtyne cultivated in August and again in November. |
| S. J. Trestrail ... ... | Salmon and Mallee | 1926 | July ... | Mouldboard | 2½—3 | Wet ... ... | Rigidtyne cultivated in October. |

## FALLOW COMPETITION, 1932.

### MERREDIN AGRICULTURAL SOCIETY.

Judge: A. S. WILD, Agricultural Adviser.

For the 50-acre Fallow Competition conducted by this Society there were nine competitiors.

The rainfall recorded from June to January, inclusive, is shown in the table hereunder:—

| Centre. | Fallowing Rains. | | | | Spring Rains. | | | Summer Rains. | | | | Total June to Jan. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | June. | July. | Aug. | Total. | Sep. | Oct. | Total. | Nov. | Dec. | Jan. | Total. | |
| Merredin ... ... | 92 | 289 | 286 | 667 | 79 | 296 | 375 | ... | 15 | 23 | 38 | 1,080 |
| Ulva ... ... | 98 | 343 | 297 | 738 | 57 | 339 | 396 | ... | 14 | 27 | 41 | 1,175 |
| Belka ... ... | 147 | 325 | 319 | 791 | 91 | 305 | 396 | 2 | 14 | ... | ... | ... |
| Baandee ... ... | 74 | 234 | 353 | 661 | 70 | 296 | 366 | 7 | ... | 10 | 17 | 1,034 |
| Burracoppin ... | 105 | 291 | 224 | 630 | 32 | 292 | 324 | ... | 25 | 11 | 36 | 990 |
| South Burracoppin | 82 | 289 | 245 | 616 | 156 | 324 | 480 | ... | 13 | 36 | 49 | 1,145 |
| Nukarni ... ... | 93 | 277 | 231 | 601 | 75 | 263 | 338 | ... | 22 | 9 | 31 | 970 |

The winning entry, that of Mr. J. Kay, was a good even fallow, showing evidence of careful workmanship. The mulch was very fair, whilst the consolidation of the seed bed was excellent.

Points were lost for weed growth, which consisted only of Prickly Potato weed (Solanum hoplopetalum) scattered over the fallow, all others having been effectively dealt with by stocking heavily with sheep during the spring months.

Two competitors tied for second place, Messrs. McPharlin and Sons, of South Burracoppin, and Mr. E. E. Reichelt, both being awarded 90 points.

Although the consolidation of the seed bed of Messrs. McPharlin and Sons' fallow was good, the mulch had apparently been worked a little too fine, and a few hard patches had formed.

The mulch of Mr. Reichelt's entry would, perhaps, have improved with an extra cultivation.

The cultural details of the competitors are summarised in the following table:—

| Competitor. | District. | Moisture. 40 pts. | Mulch. 10 pts. | Freedom from Weeds. 10 pts. | Consolidation of Seed bed. 20 pts. | Uniformity of Preparation. 20 pts. | Total. 100 pts. |
|---|---|---|---|---|---|---|---|
| Kay, J. ... ... | Baandee ... ... | 36 | 9 | 8 | 19 | 19 | 91 |
| McPharlin & Sons ... | South Burracoppin | 36 | 8 | 9 | 19 | 18 | 90 |
| Reichelt, E. E. ... | North Burracoppin | 36 | 8 | 8 | 19 | 19 | 90 |
| Smallacombe, T. H. ... | Merredin ... | 37 | 8 | 7 | 19 | 18 | 89 |
| Teasdale, H. W. ... | Ulva ... ... | 35 | 9 | 9 | 17 | 19 | 89 |
| Flockhart, I. H. ... | Belka ... ... | 34 | 8 | 8 | 19 | 18 | 87 |
| Teasdale, F. O. ... | Korbel ... ... | 33 | 8 | 9 | 19 | 18 | 87 |
| Cockram, W. H. ... | Nukarni ... ... | 33 | 8 | 7 | 19 | 18 | 85 |
| Clothier, J. C. ... | Ulva ... ... | 30 | 8 | 8 | 19 | 18 | 83 |

CULTURAL DETAILS.

| Competitor. | Timber. | Cleared. | Ploughed. | Implement. | Depth of Ploughing. | Condition of Land at Ploughing. | Other Cultivations. |
|---|---|---|---|---|---|---|---|
| J. Kay ... ... ... | ... | ... | June and early July | Mouldboard | inches. 4 | ... | Cross cultivated with rigid-tyne cultivator in August, afterwards heavily stocked with sheep. |
| McPharlin & Sons ... | Gimlet | 1926 | June | Disc | 3 | Good to Hard | Springtyne cultivated 3in. deep early July ; Springtyne cultivated middle of August and again late October. |
| Reichelt, E. E. ... ... | Salmon and Gimlet | Old land | April | Disc | 3½ | Good | Harrowed in June. Rigidtyne cultivated in June and again in September. |
| Smallacombe T. H. ... | Salmon and Mallee | 1927 | June | Disc | 4 | Wet | Springtyne cultivated twice in September. |
| Teasdale, H. W. ... | Gimlet and Salmon | Old land | June and July | Mouldboard | 3½ | Good | Rigidtyne cultivated in early September and again in late October. |
| Flockhart, I. H. ... | Salmon and Gimlet | Old land | June | Mouldboard | 2½ | Hard | Springtyne cultivated in August and again in September. |
| Teasdale, F. O. ... ... | Gimlet | 1924 | Late July | Mouldboard | 3 | Good | Springtyne cultivated in August, again in September, and again in October. |
| Cockram, W. H. ... | Tea-tree, Mallee and Gimlet | 1912 | July | Disc | 3½-4 | Good | Springtyne cultivated in October. |
| Clothier, J. E. ... ... | Jam, Mallee and Gimlet | Old land | July | Disc | 3 | Excellent | Springtyne cultivated in September, again in October, and again in January. |

## 50 ACRE FALLOW COMPETITION.

### BRUCE ROCK AGRICULTURAL SOCIETY.

Judge—R. P. ROBERTS, Agricultural Adviser.

Five entries were judged in the above competition, the awards being as follow:—

| Competitor. | District. | Moisture. 40 points. | Condition of mulch. 10 points. | Absence of weeds. 10 points. | Consolidation of seed bed. 20 points. | Uniformity of preparation. 20 points. | Total. 100 pts. |
|---|---|---|---|---|---|---|---|
| Pimlott, S. H. ... | Kwolyin ... | 38 | 8 | 9 | 17 | 18 | 90 |
| Smith, C. & A. H. ... | Yalbarrin ... | 36 | 8 | 9 | 16 | 17 | 86 |
| Brown, S. A.... ... | Bruce Rock ... | 35 | 7 | 9 | 17 | 17 | 85 |
| Farrall & Sons, F. C. | Yarding ... | 35 | 7 | 9 | 16 | 17 | 84 |
| Smith, C. & Sons ... | Yarding ... | 34 | 7 | 9 | 16 | 16 | 82 |

The competition was won by Mr. S. H. Pimlott, of Kwolyin, with an entry which gained 90 points. The land, which had previously carried gimlet and salmon gum, was worked in a two-year rotation of fallow and wheat. The most notable feature of this entry was the high moisture content of the grey sandy clay subsoil.

It was noticed that several of the fallows inspected had been worked with implements with one or more strained or incorrectly adjusted tynes. This caused a certain amount of ridging of the seed bed and consequent loss of points.

The rainfalls recorded at the various centres in the district were as follow:—

| Centre. | 1932. June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | 1933. Jan. | Feb. | Mar. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bruce Rock ... ... | 99 | 288 | 355 | 62 | 340 | ... | 8 | 25 | 4 | 34 | 1,215 |
| The Granites ... ... | 76 | 301 | 342 | 131 | 424 | ... | 18 | ... | ... | ... | ... |
| Bruce Rock South ... | 96 | 280 | 262 | 75 | 312 | ... | 17 | 38 | ... | 43 | 1,123 |

The cultural details are given in the accompanying table.

BRUCE ROCK AGRICULTURAL SOCIETY.

FIFTY ACRE FALLOW COMPETITION.

CULTURAL DETAILS.

| Competitor. | Original Timber. | When Cleared. | When Ploughed. | Implement. | Depth of Ploughing. | Condition of Land. | Subsequent Cultivations. | Rotation. | Sheep. |
|---|---|---|---|---|---|---|---|---|---|
| Pimlott, S. H. ... ... | Gimlet and Salmon gum | Old land | June ... ... | Rigidtyne Cultivator | 3in. | Good | Springtyne cultivated in August and again after rain in October | Fallow-Wheat | Yes |
| Smith, C. & A. H. ... | Salmon gum and Gimlet | Old land | June ... ... | Rigidtyne Cultivator | 3in. | Good | Rigidtyne cultivated end of July; Springtyne cultivated after rain in October | Fallow-Oats-Fallow-Wheat | Yes |
| Brown, S. A. ... ... | Gimlet and Salmon gum | Old land | June ... ... | Rigidtyne Cultivator | 3in. | Good | Rigidtyne cultivated in October | Wheat-Oats-Fallow | Yes |
| Farrall, F. C. & Sons ... | Salmon gum, Gimlet and Mallee | Old land | Early June ... | Disc Cultivating Plough | 3in. | Good | Rigidtyne cultivated in July and again in September. Springtyne cultivated October-November | Fallow-Oats-Pasture-Pasture-Fallow | Yes |
| Smith, C. & Sons ... | Salmon gum and Gimlet | Old land | Portion with Rigidtyne in July. All ploughed in August. | Disc Cultivating Plough | 2½in. 3in. | Good | Disced in September; springtyne cultivated and part scarified after rain in October | Wheat-Oats-Fallow | Yes |

## 50 ACRE FALLOW COMPETITION.

### NUNGARIN AGRICULTURAL SOCIETY.

Judge—R. P. ROBERTS, Agricultural Adviser.

Nine entries were received for this competition, which was judged at the end of March, 1933. The rain gaugings at the various centres in the district were as follow:—

| Centre. | 1932. | | | | | | | 1933. | | | Total, June to December. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | |
| Mangowine ... ... | 45 | 273 | 270 | 49 | 192 | ... | ... | 19 | 33 | 11 | 892 |
| Nukarni ... ... | 93 | 277 | 231 | 75 | 263 | ... | 22 | 9 | ... | 22 | 992 |
| Nungarin ... ... | 66 | 279 | 262 | 60 | 239 | ... | 45 | 11 | 4 | 65 | 1,031 |
| Kooroloo ... ... | 69 | 293 | 262 | 60 | 276 | ... | 45 | 11 | 4 | 65 | 1,025 |

The points awarded are set out in the accompanying table:—

| Competitor. | District. | Moisture. 40 points. | Condition of Mulch. 10 points. | Absence of Weeds. 10 points. | Consolidation of Seed bed. 20 points. | Uniformity of Preparation. 20 points. | Total. 100 pts. |
|---|---|---|---|---|---|---|---|
| Jolly, H. ... ... | Nungarin ... | 33 | 8 | 9 | 18 | 19 | 87 |
| Jolly, J. ... ... | Nungarin ... | 33 | 8 | 9 | 18 | 17 | 85 |
| Creagh Bros. ... | Kwelkan ... | 35 | 7 | 9 | 16 | 17 | 84 |
| Evans, L. D. ... | Nukarni ... | 33 | 8 | 8 | 17 | 18 | 84 |
| Green, T. W. ... | Kwelkan ... | 32 | 8 | 9 | 16 | 18 | 83 |
| Jolly, R. ... ... | Nungarin ... | 33 | 7 | 9 | 17 | 17 | 82 |
| Williams, F. A. ... | Mangowine ... | 31 | 8 | 7 | 18 | 17 | 81 |
| Francis, Mrs. ... | Nungarin ... | 32 | 8 | 5 | 18 | 18 | 81 |
| Hoare, H. L. J. ... | Burran Rock ... | 30 | 7 | 9 | 17 | 17 | 80 |

The competition was won by Mr. H. Jolly with an entry which gained 87 points. The land had originally carried gimlet, salmon gum, tea-tree, and some scattered morrel. The entry submitted was very even in appearance and had a good loose mulch, which was, if anything, rather too fine. This, however, could not be avoided on the particular type of country.

It was noticed that several competitors had worked their fallows dry shortly before judging. Little, if any, benefit can result from this practice, and if take-all is prevalent, this is one of the surent means of spreading the infection.

The cultural details are set out in the accompanying table:—

NUNGARIN AGRICULTURAL SOCIETY.

50 ACRE FALLOW COMPETITION.

CULTURAL DETAILS.

| Competitor. | Original Timber. | When ploughed. | Implement. | Depth. | Condition of Land. | Subsequent Cultivations. | Sheep. |
|---|---|---|---|---|---|---|---|
| Jolly, H. ... ... ... | Salmon gum, gimlet, tea-tree, and scattered morrel | June ... ... | Mouldboard ... | 3½ 4in. | Very Good ... | Harrowed in August; Springtyne cultivated in March. | Yes |
| Jolly, J. ... ... ... | Salmon gum and gimlet ... | June ... ... | Rigidtyne scarifier | 4in. | Good ... ... | Rigidtyne scarified in September and harrowed (dry) at the beginning of March | No |
| Creagh, Bros. ... ... | Salmon, gimlet, yorrel, mallee, and some scrub | July ... ... | Gaston disc ... | 4in. | Good ... ... | Rigidtyne scarified at the end of September | Yes |
| Evans, L. D. ... ... | Salmon gum and gimlet ... | June ... ... | Mouldboard and a little with disc cultivating plough | 3in. | Good ... ... | Harrowed end of July; Rigidtyne scarified in August. Harrowed and Springtyne cultivated in October. | Yes |
| Green, T. W. ... ... | Salmon gum, gimlet and mallee | June ... ... | Disc cultivating plough | 3–4in. | Good ... ... | Springtyne cultivated in July. Cultivated with a disc implement in August to kill weeds. Springtyne cultivated after rain in December, and again after rain in March | Yes |
| Jolly, R. ... ... ... | Salmon gum, gimlet and manna | End of July ... | Rigidtyne scarifier | 4in. | Good ... ... | Skim ploughed in September with a mouldboard, harrowed (dry) at the beginning of March. | No |
| Williams, F. A. ... ... | Salmon gum, gimlet and mallee | June ... ... | Rigidtyne scarifier | 3in. | Good ... ... | Rigidtyne scarified in September, and harrowed (dry) in March. | Yes |
| Francis (Mrs.) ... ... | Salmon gum and gimlet ... | July ... ... | Disc cultivating plough | 4in. | Good ... ... | Rigidtyne scarified and harrowed in Spring | Yes |
| Hoare, H. L. J. ... | Salmon gum, jam scrub, gravel scrub-plain, mallee | July ... ... | Disc cultivating plough | 3in. | Good ... ... | Rigidtyne scarified in September ... ... | Yes |

## FALLOW COMPETITION, 1933.

### PHILLIPS RIVER AGRICULTURAL SOCIETY.

Judge—A. S. WILD, Agricultural Adviser.

Six entries were submitted for inspection in the fallow competition conducted by the above society, awards being made as follow:—

| Competitor. | District. | Moisture. 40 points. | Mulch. 10 points. | Absence of Weeds. 10 points. | Consolidation of Seed-bed. 20 points. | Uniformity of Preparation. 20 points. | Total. 100 pts. |
|---|---|---|---|---|---|---|---|
| Bebbington Bros. ... | Mt. Short ... | 35 | 9 | 9 | 19 | 19 | 91 |
| Skinner, E. ... ... | Ravensthorpe... | 36 | 9 | 8 | 19 | 18 | 90 |
| McCullock. J. ... | Ravensthorpe... | 36 | 8 | 8 | 19 | 18 | 89 |
| Campbell, J. ... ... | Mt. Short ... | 35 | 8 | 7 | 19 | 18 | 87 |
| Dasborough, S. C. B. | Ravensthorpe... | 36 | 7 | 8 | 18 | 18 | 87 |
| Love, J. W. ... ... | Ravensthorpe... | 35 | 8 | 6 | 18 | 18 | 85 |

The monthly rainfalls as recorded from June to March inclusive at Ravensthorpe and Mt. Short, respectively, are shown below:—

| Centre. | Fallowing Rains. | | | | Spring Rains. | | | Summer Rains. | | | | | | Total June to Mar. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | June. | July. | Aug. | Total. | Sept. | Oct. | Total. | Nov. | Dec. | Jan. | Feb. | Mar. | Total. | |
| Ravensthorpe ... | 198 | 145 | 235 | 578 | 167 | 430 | 597 | 62 | 7 | 86 | Nil | 247 | 402 | 1,577 |
| Mt. Short ... | 158 | 186 | 171 | 515 | 136 | 379 | 515 | 26 | 5 | 53 | Nil | 181 | 265 | 1,295 |

The winning entry, that of Messrs. Bebbington Bros., was an excellent, well-prepared fallow. The land had been ploughed to a depth of 3½ inches with a mouldboard plough during the previous July. The subsequent cultivations with a springtyne implement had resulted in a good consolidated seed-bed and an excellent mulch. Very little weed growth was in evidence.

Generally the fallows entered in this competition all showed a high moisture content, but this was due to rains which had fallen but a short time prior to inspection.

The cultural details of the competing fallows are shown hereunder:—

PHILLIPS RIVER AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1933.

CULTURAL DETAILS.

| Competitor. | Original Timber. | Years Cleared. | When Ploughed. | Implement. | Depth. | Condition of Land. | Subsequent Cultivations. |
|---|---|---|---|---|---|---|---|
| Bebbington Bros. ... | Salmon, gimlet, mallee, mort | Four ... ... | Mid July ... | Mouldboard ... | 3½in. | Good | Springtyne cultivated early September and again early November, after rain. Portion springtyne cultivated after rain early in January. |
| Skinner, E. ... ... | Mallee and gimlet ... | Seven ... ... | Late July ... | Mouldboard ... | 4in. | Good | Springtyne cultivated early September, and again in October. |
| McCullock, J. ... ... | Mallee and salmon ... | Seven ... ... | July ... ... | Mouldboard ... | 4in. | Good | Springtyne cultivated early September. |
| Campbell, J. ... ... | Salmon and jam ... | Old land ... | Early June ... | Mouldboard ... | 3½ 4in. | Good | Springtyne cultivated early September. |
| Dasborough, S. C. B. ... | Mallee, salmon and gimlet | Old land ... | July August ... | Mouldboard ... | 4in. | Good | *Nil.* |
| Love, J. W. ... ... | Mallee and broomebush | Old land ... | Late June ... | Mouldboard ... | 4in. | Good | Springtyne cultivated mid September, and portion again Springtyne cultivated late September. |

# UNTHRIFTINESS OF MERINO WEANERS DUE TO WORM INFESTATION.

H. W. BENNETTS, D.V.Sc.

It has been stated frequently by sheep owners in the agricultural districts that their Merinos do not "do well" during the first year of life. Of recent years it has become apparent on certain properties in the Midland and Great Southern Districts that something serious is amiss. Despite good nutritional conditions, a large percentage of lambs receive a severe check in growth after weaning and mortalities of more than 15 per cent. have been experienced. Investigation, as yet incomplete, indicates that the disease is due to heavy worm infestation with species other than *Haemonchus contortus*, the barber's pole worm.

We have reason to believe that this weaner trouble is rather widespread, though on account of the insidious nature of the disease it is apt to be overlooked for some time. Poor success in the rearing of weaners is ascribed, probably, to seasonal or nutritional influences, and it may not be recognised for a few years that some other factor is responsible. The purpose of this article is to describe the complaint and to recommend owners of flocks so affected to give early and systematic worm treatment a trial.

Until quite recently it had been accepted generally that *Haemonchus contortus* was economically the most important worm affecting the gastro-intestinal tract of sheep. It was considered, also, to be the chief cause of parasitic complaints of sheep in this State, and treatment has been recommended accordingly. It is now known that other species of worms, particularly *Trichostrongyles*, are quite as important and are more frequently the cause of trouble in young sheep. Seddon* and Edgar† give an account of trichostrongylosis (the condition due to infestation with these worms) in N.S.W. which accurately describes the Merino weaner trouble observed in Western Australia. Further, on properties where the disease has been investigated locally heavy infestations with *Trichostrongyles* have been associated. On one of these properties, where serious difficulty has been experienced, the institution of suitable worm treatment appears to have definitely overcome the trouble.

## THE WORMS RESPONSIBLE.

(i) *Trichostrongylus spp.*—There are several species of these "hair worms" which affect sheep. They are very minute worms less than half an inch in length and as thin as a fine hair. They are found in the small intestine and are most numerous in the first 15 feet from the fourth stomach, exclusive of the first 3 feet. They usually lie coiled up on or in the inner lining of the bowel, and, being bloodsuckers, stand out red against the whitish background. They can be fairly readily seen on a bright day with the naked eye, but the use of a hand lens is a valuable aid, particularly in dull weather. Other larger worms, notably *Ostertagia spp.* and *Nematodirus filicollis* may also be found in the small intestine, but in cases we have examined *Trichostrongylus spp.* were particularly numerous and few other worms were present in that situation. *Trichostrongylus* also occurs in small numbers in the fourth stomach. An indication of the numbers present in the small bowel of an animal, which has died or been killed for examination, can

* Seddon, H. R.—*Agricultural Gazette*, N.S.W., 44: 288, 1933.
† Edgar, G.—*Ibid.*, 44: 383, 1933.

be arrived at by the following procedure:—Several feet of the small bowel (between 3-15 feet from the fourth stomach) are removed, the ends having been tied off previously to prevent escape of contents. The bowels are then slit up with scissors so that the contents and opened bowel are received into a mason jar containing water. Water is then added until jar is about two-thirds full, the cap is screwed on and the container is vigorously shaken for several minutes in order to, as far as possible, wash the parasites from the bowel wall. The bowels are then removed from the jar which is stood for about one hour to allow the worms to sediment to the bottom. The fluid is then carefully poured off until only about one inch remains on the bottom and the jar is again filled with water to about two-thirds capacity. Shake once more for a few moments and stand again for an hour or so to allow majority of worms to sediment to the bottom. Pour off the bulk of fluid as before. By this time much of the debris will have been removed and a small quantity of the residual fluid, which may be further diluted if too turbid, is poured into a shallow glass dish. If this is placed over a dark surface numerous minute whitish hair-like worms can be seen on looking through the fluid. Occasional agitation of the vessel will assist detection of the parasites, and it is preferable to use a hand lens for this purpose.

(ii) *Ostertagia spp.*—These worms also belong to the same group as *Trichostrongylus* and are referred to as *Trichostrongyles*. They are dark brown worms up to half-an-inch in length and stouter than *Trichostrongylus*. *Ostertagia* occurs principally in the fourth stomach. A careful scrutiny of the lining will reveal the parasite if present and it is distinguished from *Haemonchus contortus* by its colour and smaller size. These worms are known to produce serious effects, and we have found them in enormous numbers in lambs only five weeks old in association with *Trichostrongylus*.

The life history of *Trichostrongyles* is stated to be similar to that of *Haemonchus contortus*, though it appears evident that they are both better able to withstand dry and cold conditions than the barber's pole worm. Infestation results from the ingestion of the infective larvae, or young forms, with pasture.

## THE DISEASE (TRICHOSTRONGYLOSIS).

Merinos are said to be particularly susceptible to this complaint, and it has been noted, here, that crossbreds can be reared successfully on properties where *Trichostrongyles* cause trouble in Merinos. Trichostrongylosis is essentially a disease of lambs and young hoggets—older sheep running with them remain healthy. It appears first in the early spring and carries on through the summer and autumn.

*Symptoms.*—The chief symptoms are stunting and black scours. The check in growth usually noted about weaning time is soon followed by persistent "black scours." Affected lambs lose their vitality and gradually become poorer, despite good feeding. They become progressively weaker, there is loss of appetite, and they die from malnutrition. Those which survive the summer and autumn commence to pick up following the appearance of the new season's green feed, and recover although their small size is apparent for some months. As one would expect there is a break in the wool when they are shorn as hoggets. When first affected lambs are not anaemic, the skin appearing quite pink and healthy. They do become anaemic, however, after the disease has been present for some weeks. Pot belly and bottle jaw are absent, although they may be observed in the later stages of the disease, probably as a result of a complicating infestation with *Haemonchus contortus* which may occur as the animal becomes older.

Haemonchosis, the condition due to infestation with *Haemonchus contortus*, differs from trichostrongylosis in that all breeds are susceptible; it does not appear here until summer. Stunting is not noticeable, scouring is inconsistent, but anaemia is a marked and early symptom and pot belly and bottle jaw are common. Haemonchosis may affect sheep of all ages though we have not observed it in lambs under eight or nine months old. It is rapidly fatal. Trichostrongylosis, on the other hand, only affects young animals and the course of the disease is slow and protracted.

*Treatment.*—It is considered that the stunting of Merino weaners experienced in certain districts in this State is due to heavy infestations with *Trichostrongylus spp.* during the early life of the lamb. The effect of this early infestation, commencing when lambs begin to eat pasture, becomes manifest after weaning. Although apparently healthy when taken from their mothers, they have insufficient resistance to stand up to the changed dietetic conditions and the worm infestation which is, of course, continuous.

It has been shown in this State that worm treatment commenced in September, as recommended for haemonchosis, is ineffective for trichostrongylosis and does not arrest the progress of this complaint, even when special attention is paid to diet. In one case lambs which were taken off their mothers in really good condition collapsed when depastured on self-sown oats and trefoil, although treated systematically for parasites from September onwards. None of the remedies recommended for *H. contortus* are nearly so effective against *Trichostrongylus*, and experience in this State is showing that the only way of controlling weaner trouble due to *Trichostrongyles* is to commence worm treatment at tailing time. When lambs are a month old they should be drenched, by means of a syringe, with 3 c.c. of a mixture of equal parts of tetrachlorethylene and liquid paraffin. The treatment should be repeated at monthly intervals, the dose being increased to 5 c.c. as the lambs get older. Tetrachlorethylene is a very safe preparation to use although the transient stupefying action following its administration may cause some concern to those who have not previously used the drug.

The copper sulphate (bluestone) solution as recommended for *Haemonchus contortus*, has been stated to be somewhat more effective than tetrachlorethylene against *Trichostrongylus*. The objection to its use for young lambs is the necessity for preliminary starvation, which does not apply in the case of tetrachlorethylene. Further, a tetrachlorethylene preparation has been shown to give good results on the property referred to above when used as indicated. There appears to be no reason why the usual bluestone treatment should not be substituted when lambs are older and better able to withstand starvation prior to drenching.

Naturally it is essential to build up the lambs with the best possible diet to supplement the vermifuge treatment. Both measures are necessary and effective control will not be achieved if either is forgotten.

## ERRATA.

In the March issue of this Journal, pp. 70-72, an article dealing with Fertiliser Trials at Herdsman's Lake appears in which tables are shown as Treatment in Tons per acre. This is an obvious error and should be read as cwts. per acre, and not tons as shown.

# INSECT PESTS OF FRUIT TREES AND THEIR CONTROL.

By L. J. Newman, F.E.S., Government Entomologist,
and B. A. O'Connor, B.A., B.Sc.Ag.

In this article an effort has been made to bring together the recommended control measures for the more important orchard pests. The control of most insect pests is rendered less difficult or complicated if growers bear in mind one or two simple facts, which can be quickly learned by watching the habits of the insects causing the damage.

Insects are divided into two general groups or classes according to the mouth parts and type of injury they do. The chewing or biting insects are known as the Mandibulata. These feed by actually biting a piece out of the plant. The other class is known as the Haustellata, or sucking insects, which suck the juices out of the leaves, stems or fruit without, as a rule, showing any definite external injury to the part attacked. To be able to determine to which of these two classes of insects the pest belongs is the first essential to intelligent and successful control. What to apply in the way of a check or control is bound up in this rudimentary knowledge. Failure to control an insect pest is frequently due to the application of the wrong spray.

Biting insects, as a class, are usually controlled by covering the plants upon which they feed with a poison, such as arsenate of lead, applied either as a spray or in dust form. This is taken into the stomach with the food and subsequently causes death. Sucking insects, on the other hand, inasmuch as they do not take pieces of plant tissue into the intestine, cannot be killed by a stomach poison. These insects, are, therefore, treated with contact sprays or dusts, which either kill by contact, or else give off fumes which will destroy them, when taken into the respiratory system.

Caterpillars, beetles, grasshoppers, etc., belong to the first class, while aphids, scales, plant bugs, etc., come into the second class. What a grower has to do, therefore, is to correctly determine the nature of the damage, and to apply either a stomach poison or a contact spray or dust. If any doubt exists, specimens of the pest should be forwarded to the Entomological Branch for prompt determination. In the use or application of either a spray or dust it is essential to see that they are carefully measured, mixed and applied. In pouring the spray material into the spraying machine it should always be passed through a strainer, otherwise the valves and nozzles are bound to become blocked, causing considerable delay and annoyance.

Great care and thoroughness are necessary in spraying, because if this is badly done most of the effectiveness of the treatment will be lost. In the case of stomach poisons, the whole foliage of the plant or tree must be thoroughly covered, while in the case of contact sprays, all the insects must be brought into thorough and forceful contact. It is, therefore, essential that both sides of the leaves should be sprayed, particularly the under sides where the insects chiefly congregate.

Fumigants are also used to control certain fruit tree pests, such as scales. One of the most important applications of this method is the fumigation of citrus trees for Red Scale, Wax Scale, or other species of scale that may be infesting the trees. Calcium cyanide or sodium cyanide, in dust or other form, is the fumigant used. This gives off a gas known as hydrocyanic acid gas. Trees should only be fumigated during non-windy weather and at night. It is very essential that the foliage of the trees should be dry. If this fact is not observed considerable damage of foliage will follow, resulting in the shedding of leaves and fruit. Calcium cyanide is a very powerful poison and should be handled with extreme care. Avoid the inhalation of the gas, which is also very deadly. This treatment must only be undertaken by competent and careful operators.

It is of the greatest importance that whatever method of control is applied, it should be done at the earliest and most opportune time after the pest has appeared. The damage caused is thus kept at a minimum.

An insect is also more readily controlled if it is dealt with in the younger stages or before it has had time to reach plague form. In conjunction with the use of sprays, dusts or fumigation there must always be orchard sanitation. This means the keeping down of all weeds and rubbish, thorough cultivation and drainage of the soil and the maintenance of the trees in a healthy state of growth by the application of suitable manures.

The question of biological control must not be over-looked.

Parasites and predators, commonly known as beneficial insects, should be recognised by growers. To be able to discriminate between beneficial and destructive insects will prevent the ignorant destruction of many of our most useful insects, such destruction further unbalancing nature in favour of the destructive species.

In the attached tables and diagrams the standard spraying, dusting, and fumigation materials for chewing and sucking insects and the way in which they may be combined are given. To make use of the diagram the first consideration is the kind of fruit to be sprayed: next, the pests to be combatted and, finally the choice of the spray materials. It may be found necessary to combine spraying ingredients to deal with more than one species of insect or fungus disease present upon the tree. In this case the diagram submitted should be carefully consulted.

Combined sprays in which even only slight chemical changes take place among the ingredients should be used as soon as combined and not be held over for any length of time. Trees should never be fumigated or sprayed when out of condition or stressed through lack of available moisture. Do not spray during intense heat.

Reference is made in the tables to "red" and "white" oils, which are the terms commonly used to designate the miscible oils used in dormant spraying, and the emulsions of highly refined oils for summer spraying. The "red" or miscible oil consists of a lubricating oil in which the soap emulsifier is dissolved, and the oil is not actually emulsified until water is added. The "white" oil is a light, refined oil, already emulsified with soap and water, and is used on trees in foliage because it has not the same tendency to burn as the lubricating oils. It will be noticed in the table of compatible and incompatible sprays, that lead arsenate cannot be mixed with oil, the reason being that water-soluble arsenic is produced, causing burning. In U.S.A., however, these two sprays are frequently applied in combination, ½lb. to 1lb. of high grade hydrated lime being added to each 100 gallons of spray to prevent burning.

Nicotine sulphate is more familiar to some under the name "Black leaf 40," but it must be remembered that this is merely a trade name for one brand of nicotine sulphate, and that there are other brands on the market. Nicotine sulphate should always be used in combination with soap, unless it is already mixed with oil, Bordeaux, lime-sulphur, washing soda, or some other alkali, because if it is mixed with water alone, it does not give off all its nicotine, and is, therefore, less effective.

For tobacco wash, the formula recommended by the New South Wales Department of Agriculture is 12lbs. waste tobacco, 5ozs. washing soda, 30 gallons of water. Steep for 36 hours and strain through sacking. It will be noticed in the table that tobacco wash containing soda must not be mixed with lead arsenate or lime-sulphur. If a wash is to be mixed with lime-sulphur, use the formula 20lbs. waste tobacco, 50 gallons cold water, 4½lbs. quicklime. Slake the lime with a small quantity of water heated nearly to boiling, and add the mixture to the balance of the 50 gallons of water. Finally the tobacco waste is added, and the mixture allowed to stand for 36 hours and strained as before.

In using oil and lime-sulphur sprays, it is customary not to apply the one within a month of the other, and this is a wise precaution. Whenever any doubt exists as to the possible results of applying a combination of sprays, or two sprays in succession, consult both the chart and the table, and if these do not supply the information, apply to the Department. Do not act in the dark, as immense damage may result.

It will probably be found also, that the treatment for various insect and fungus pests clashes or overlaps. In this case a little ingenuity should solve the problem, but here also a good rule is, when in doubt, consult the Department.

In the compilation of this article, free use has been made of information from other publications, mainly "Spraying," issued by the Department of Agriculture of New South Wales, and various U.S.A. Agricultural Department bulletins. The chart and table of compatible and incompatible sprays were adapted from those appearing in "Spraying."

## CARE OF SPRAYING MACHINES.

In order to obtain satisfactory results from spraying, the spraying machines must be kept in good working order. One of the most frequent causes of trouble with the spraying machines is carelessness in leaving them dirty or partially filled with spray material.

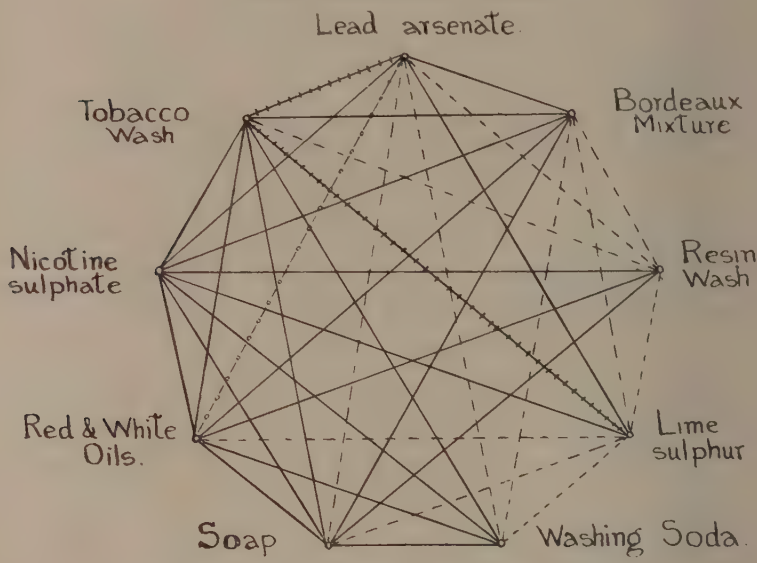
The machine should always be thoroughly washed with clean water at the end of each day's work. Clean water should also be pumped through all hose and nozzles. If this is done much trouble will be avoided. A supply of spare parts should always be on hand.

TABLE OF COMPATIBLE AND INCOMPATIBLE SPRAYS.

| Spray. | May be mixed with: | Must not be mixed with: |
|---|---|---|
| Bordeaux Mixture ... ... | Lead arsenate, Paris green, nicotine sulphate, tobacco wash, red and white oils, soap* | Lime sulphur, resin wash, washing soda, |
| Burgundy Mixture ... | Nicotine sulphate ... ... ... | Lead arsenate, Paris green, lime sulphur, resin wash, soap, washing soda. |
| Lead arsenate ... ... | Bordeaux, lime sulphur, atomic sulphur, nicotine sulphate, tobacco wash (if it contains no soda), white oils | Resin wash, soap, washing soda, red oils, tobacco wash (if it contains soda). |
| Lime sulphur ... ... | Lead arsenate, nicotine sulphate, tobacco wash (made with lime, not soda) | Bordeaux, Burgundy, resin wash, soap, washing soda, red and white oils. |
| Paris Green ... ... | Bordeaux, nicotine sulphate ... ... | Resin wash, soap, washing soda. |
| Resin wash ... ... ... | Kerosene emulsion, nicotine sulphate, red and white oils, soap | Bordeaux, Burgundy, lead arsenate, lime-sulphur, Paris green, tobacco wash. |
| Soap ... ... ... | Bordeaux, tobacco wash, nicotine sulphate, resin wash, washing soda, red and white oils | Burgundy, lime-sulphur, lead arsenate, Paris green. |
| Atomic sulphur ... ... | Lead arsenate, Paris green, lime-sulphur. | |
| Red and white oils ... | Nicotine sulphate, resin wash, Bordeaux, soap, lead arsenate (with white oils only) | Lime-sulphur, lead arsenate (can be mixed with white oils). |
| Nicotine sulphate ... ... | Bordeaux, Burgundy, lead arsenate, lime-sulphur, red and white oils, resin wash, soap, washing soda | |
| Tobacco wash ... ... | Lead arsenate (if wash contains no soda), lime-sulphur (when wash prepared with quicklime), soap, nicotine sulphate, washing soda, Bordeaux, red and white oils | Lead arsenate (if wash contains soda), Paris green, lime-sulphur (if wash contains soda). |
| Washing soda ... ... | Red and white oils, soap, nicotine sulphate, tobacco wash | Bordeaux, Burgundy, lime-sulphur, lead arsenate, Paris green. |

* Mixing oil and Bordeaux leads to some loss of efficiency in the insecticidal action of the oil.

SPRAY COMPATIBILITY CHART.




Sprays connected by a black line may be mixed together.

Sprays connected by a dotted line *must not* be mixed together.

—o—o—o— Lead arsenate may be mixed with white oils, but not with red oils.

—!—!—!— Lead arsenate or lime-sulphur may be mixed with tobacco wash only if the wash contains no soda.

## SPRAYING CALENDAR FOR FRUIT TREES.

| Pest. | Treatment | Time of Application. | Remarks. |
|---|---|---|---|
| Codlin Moth ... ... | (1) Spray with arsenate of lead powder 2½lbs., white oil 1 gallon, water 100 gallons<br>(2) Trap with molasses 1 part, water 9 parts, placed in glass jars hung in trees<br>(3) Scrape loose bark from trunks, destroy infested fruit daily by boiling, use hessian bands on trunks | Calyx spray—After petals fall and before calyx closes<br>Five cover sprays at about following intervals :—<br>1st—10–12 days after calyx spray<br>2nd—14 days later<br>3rd—6 weeks after 2nd<br>4th—10–12 days later<br>5th—14 days after 4th | The white oil is not used in the calyx spray, but should be included in the cover sprays.<br>The cover sprays are applied at the time indicated by the catch in the moth traps. |
| Bryobia Mite ... | (1) Spray, red oil 1 in 20 ... ...<br>(2) Summer spray, white oil 1 in 100<br>(3) Destroy all prunings by burning | Just before buds swell<br>3 weeks after hatching of first mites (usually October). Similar spraying 3 weeks later (November) | Nicotine sulphate 1¼ pints to 100 gals. can be added to the white oil spray if desired. |
| Apple Curculio ... | (1) Apply bait round bases of trees at rate of 15lbs. per acre. Bait 1lb. Sodium Fluoride, 9lbs. minced dried apple<br>(2) Spray with lead arsenate powder 1oz., water 1 gallon | First baiting—Last week in November. Second baiting—third week in February<br>Same times as bait (see above) | The first baiting alone may be sufficient. If not, apply the second bait.<br>Use the lead arsenate spray only when the trees are not fruiting. |
| Plague thrips ... | (1) Spray with winter oil ... ...<br>(2) Dust with pyrethrum powder 1 part, flowers of sulphur 8 parts (Recommendation of Mr. J. W. Evans, M.A., Officer of C.S.I.R.) | Early in dormant period<br>During blossoming ... | To advance blossoming dates.<br>This dust has a repellent effect for several days. |

## APPLE.

| Pest. | Treatment. | Time of application. | Remarks. |
|---|---|---|---|
| Apple and Pear Aphis | Nicotine sulphate 1¼ pints, household soap 4 lbs., water to make 100 gallons ; or nicotine sulphate 1¼ pints, white oil 1 gallon, water to make 100 gallons | When Aphids observed | Apply with coarse nozzle and high pressure. |
| Fruit-fly ... ... | (1) Gather fallen and infested fruits every 24 hours, destroying those infested, by boiling<br>(2) Trap with Clensel 1 part, water 29 parts ; or pollard 8 ozs., borax 8 ozs., arsenate of soda ½ oz., water 1 gallon : renew lure every 7 days<br>(3) Bait with foliage bait : 1 gallon fruit syrup preferably from oranges, 4 lbs. molasses, 2½ ozs. lead arsenate powder, water to make 4 gallons. Bait the foliage every 7 days<br>Ready-made bait on market | Control measures must be carried on from a period of six weeks before ripening of fruit, until all fruit is removed from the tree | (1) is compulsory whenever fruit-fly is present.<br>(2) is compulsory for orchards of from 1 to 200 trees, at least two traps per tree being used.<br>Orchardists having more than 200 trees must use either (2) or (3). |
| Termites ... ... | (1) Bore a hole into the gallery of the termites, pour in 1 oz. Carbon-bi-sulphide and plug with wet clay ; or puff Paris green into the gallery<br>(2) Bait : 4½lbs. molasses, 1½lbs. sugar, ½lb. arsenate of soda, ½-pint water. Mix and heat molasses and sugar, dissolve arsenate of soda in ½-pint of boiling water and stir into molasses and sugar. Put liberal dose of mixture between two pieces of pine and bury close to infested trees<br>Fumigation : With Carbon-bi-sulphide, or Paradichloro-benzine | ... ... ... ...<br>... ... ... ... | Very poisonous.<br>When roots affected. |
| Woolly aphis ... | (1) Red oil spray, 1 in 15 ... ...<br>(2) Spray with nicotine sulphate 1¼ pints, household soap 4 lbs., water to make 100 gallons | During dormant period<br>Whenever aphis appears in numbers in the summer | The woolly aphis is well controlled by a parasite *Aphelinus mali*, which should be established if it is not already present. |
| San José Scale, Mussel Scale, Greedy Scale | (1) Spray with red oil 1 in 15, or lime sulphur (winter strength) ...<br>(2) Destroy all prunings by fire | During dormant period<br>During late dormant period | |
| Loopers, Climbing Cutworms, and other Caterpillers | (1) Arsenate of lead powder 1½ lbs., water 50 gallons<br>(2) Plough early to turn in weeds which harbour Cut-worms | When Caterpillars present | |
| Bud, Bark and Leaf-eating Beetles, Grasshoppers, etc. | Spray with arsenate of lead powder 3 lbs., water 50 gallons | When pests observed... | Do not use this spray later than December while the fruit is on the tree. |

## PEAR.

| | |
|---|---|
| Codlin Moth ... ... | *See* under Apple. |
| Bryobia Mite ... | *See* under Apple. |
| Apple Curculio ... | *See* under Apple. |
| Plague Thrips ... | *See* under Apple. |
| San José Scale ; Greedy Scale | *See* under Apple. |
| Black Scale ; Vine Scale | (1) Spray with red oil or lime sulphur (winter strength)<br>(2) Destroy all prunings by burning<br>During dormant period |
| Looper and other Caterpillars | *See* under Apple. |
| Bud, Bark and Leaf-eating Beetles, Grasshoppers, etc. | *See* under Apple. |

PEAR—*continued.*

| Pest. | Treatment. | Time of application. | Remarks. |
|---|---|---|---|
| Apple and Pear Aphis | *See* under Apple. | | |
| Fruit-fly ... ... | *See* under Apple. | | |
| Termites ... ... | *See* under Apple. | | |
| Pear Slug ... ... | Spray with lead arsenate powder 1¼ lbs., water 50 gallons | When slug present | |
| Pear-leaf Blister Mite | (1) Red oil spray ... ... ...<br>(2) Spray with lime sulphur 1 in 75 (32 Beaume') to 1 in 65 (28 Beaume') plus calcium caseinate spreader | In early dormant period<br>At bud pinking stage | Spreader is necessary to penetrate the opening buds. |

PEACH AND NECTARINE.

| | | | |
|---|---|---|---|
| Bryobia Mite ... | *See* under Apple. | | |
| Fruit-fly ... ... | *See* under Apple. | | |
| San José Scale, Greedy Scale | *See* under Apple. | | |
| Vine Scale, Black Scale | *See* under Pear. | | |
| Termites ... ... | *See* under Apple. | | |
| Climbing Cut-worm and other Caterpillars | *See* under Apple. | | |
| Green Peach Aphis ... | Treat as for Apple and Pear Aphis, under Apple | When Aphis observed | |
| Black Peach Aphis ... | (1) Remove 2in. or 3in. of soil from round tree, apply liberal dressing of tobacco dust and replace soil | During dormant period | This treatment is directed at the root-feeding forms of the Aphis. |
| | (2) Spray with nicotine sulphate 1½ pints, household soap 4 lbs., water to make 100 gallons | In spring, when first aphids appear on shoots | |
| Rutherglen Bug ... | (1) Keep orchard and adjoining areas, if possible, free from weeds in spring<br>(2) Use smoke smudges ... ...<br>(3) Dust with equal parts calcium cyanide dust and flowers of sulphur<br>(4) Spray with good contact spray, *e.g.* turps 5 pints, Sunlight soap 12 lbs., water to make 100 gallons | ... ... ... ...<br>When bugs are attacking fruit | Careful observation of surrounding grass paddocks in spring and early summer reveals presence of young bugs, and danger of swarming may be estimated. If large numbers are found, burn off the grass as soon as possible. |
| Bush Bug ... ... | (1) Shake off trees and destroy ...<br>(2) Spray with Sunlight soap and turps, as under Rutherglen Bug | When bugs observed | |
| Bud, Bark, and Leaf-eating Beetles, Grasshoppers, etc. | *See* under Apple. | | |

APRICOT.

| | | | |
|---|---|---|---|
| Fruit-fly ... ... | *See* under Apple. | | |
| San José Scale, Greedy Scale | *See* under Apple. | | |
| Vine Scale, Black Scale | *See* under Pear. | | |
| Termites ... ... | *See* under Apple. | | |
| Rutherglen Bug ... | *See* under Peach. | | |
| Bush Bug ... ... | *See* under Peach. | | |
| Climbing Cut-worms, and other Caterpillars | *See* under Apple. | | |

APRICOT—*continued.*

| Pest. | Treatment. | Time of application. | Remarks. |
|---|---|---|---|
| Leaf-eating Beetles, Grasshoppers, etc. | *See* under Apple. | | |

QUINCES.

| | | | |
|---|---|---|---|
| Codlin Moth ... ... | *See* under Apple. | | |
| Fruit-fly ... ... | *See* under Apple. | | |
| San José Scale, Greedy Scale | *See* under Apple. | | |
| Black Scale ... ... | *See* under Pear. | | |
| Soft Brown Scale ... | (1) Spray with red oil ... ...<br>(2) Destroy prunings by burning | During dormant period | |
| Termites ... ... | *See* under Apple. | | |
| Bud, Bark, and Leaf-eating Beetles, Grasshoppers, etc. | *See* under Apple. | | |
| Leaf-eating Caterpillars | *See* under Apple,. | | |

PLUM.

| | | | |
|---|---|---|---|
| San José Scale, Greedy Scale | *See* under Apple. | | |
| Black Scale, Vine Scale | *See* under Apple. | | |
| Fruit-fly ... ... | *See* under Apple. | | |
| Bryobia Mite ... | *See* under Apple. | | |
| Termite ... ... | *See* under Apple. | | |
| Bud, bark and leaf-eating Beetles, Grasshoppers, etc. | *See* under Apple. | | |
| Leaf-eating caterpillars | *See* under Apple. | | |

CHERRY.

| | | | |
|---|---|---|---|
| San José Scale, Greedy Scale | *See* under Apple. | | |
| Pear Slug ... ... | *See* under Pear. | | |
| Cherry Borer .. | Place in bore a plug of cotton-wool soaked in carbon-bi-sulphide, and plug with damp clay | When boring observed | Do not bring lights near carbon-bi-sulphide, as it is inflammable and explosive. |
| Rutherglen Bug ... | *See* under Peach. | | |

LOQUAT.

| | | | |
|---|---|---|---|
| Fruit-fly ... ... | *See* under Apple. | | |
| Tussock-moth Caterpillars | Spray with lead arsenate powder. 3lbs., water, 100 gallons | When caterpillars seen on leaves | |
| Greedy Scale ... | *See* under Apple. | | |
| Soft Brown Scale ... | Spray with ~~red~~ white oil when scale present. | During dormant period | |

4 p. 373

ALMOND.

| Pest. | Treatment. | Time of application. | Remarks. |
|---|---|---|---|
| Bryobia Mite ... | *See* under Apple. | | |
| Red Spider ... ... | (1) Spray with red oil. ... ...<br>(2) Spray with white oil, 1–100, or lime-sulphur 1–50 | During dormancy<br>Two or three weeks after first appearance in spring or early summer | A second spring spraying is advisable 10 days after the first. |
| Greedy Scale, San José Scale | *See* under Apple. | | |
| Black Scale, Vine Scale | *See* under Pear. | | |
| Cherry Borer .. | *See* under Cherry. | | |

FIG.

| | | | |
|---|---|---|---|
| Greedy Scale ... | *See* under Apple. | | |
| Soft Brown Scale ... | *See* under Quince. | | |
| Red Scale ... ... | (1) Sprap with red oil ... ...<br>(2) Destroy all prunings by burning | During dormant period | |
| Fruit-fly ... ... | *See* under Apple. | | |

GRAPE.

| | | | |
|---|---|---|---|
| Vine Scale ... ... | *See* under Pear. | | |
| Hawk Moth Caterpiller | (1) Spray with lead arsenate powder, 3lbs., water, 100 gallons<br>(2) Destroy by hand. | When observed. | |
| Vine Foliage Thrips ... | Spray with nicotine sulphate 1½ pints, household soap 4lbs., water to make 100 gallons | When Thrips present. | |
| Climbing Cutworm, and other Caterpillars | (1) Spray with lead arsenate powder 3lbs., water 100 gallons<br>(2) Turn in weeds ... ... ... | For Climbing Cutworm on grapes, first spray when Cutworms first observed, one or more cover sprays at 10 day intervals<br>As early as possible | |
| Rutherglen Bug ... | *See* under Apple. | | |
| Leaf-eating Beetles, Grasshoppers, etc. | *See* under Apple. | | |

CITRUS.

| | | | |
|---|---|---|---|
| White Wax Scale ... | Fumigate with calcium cyanide, or spray with white oil, or 1lb. washing soda to 1 gallon water | March and April.<br>First spray early January, second spray end of February or early March | Soda ash may be used at half the strength recommended for washing soda |
| Red Scale, Soft Brown Scale, Black Scale | Fumigate with calcium cyanide, or<br>Spray with white oil | January, February, March, April<br>February, March, April | Two sprayings may be necessary. |
| Black Orange Aphis ... | Spray with nicotine sulphate 1½ pints, household soap 4lbs., water to make 100 gallons | When aphis observed in autumn and spring | Two or three sprayings at intervals of about two days will probably be necessary. |
| Fruit-fly ... ... | *See* under Apple. | | |
| Orange Rust Mite ... | Spray with lime-sulphur 1 in 75, or<br>Dust with flowers of sulphur | When russeting of fruit noticed<br>Usually March and April | One good application should suffice. |
| Leaf-eating Caterpillars | *See* under Apple. | | |
| Leaf and blossom-eating Beetles, Grasshoppers, etc. | Spray with lead arsenate powder 3lbs. to 50 gallons | When observed. | |

# OAT VARIETY TRIALS IN THE SOUTH-WEST.

M. Cullity, Agricultural Adviser, Dairy Branch.

The results of two further Oat Variety Trials conducted in the South-West are here recorded.

At Donnybrook and Balingup the experiments were conducted on the properties of Messrs. B. Langridge and G. E. White, results of which were as follow:—

*B. Langridge, Donnybrook.*

Soil: Dark clay loam.

Cultivation: Ploughed single furrow, disc cultivated and harrowed in June.

Rate of Seeding: 2 bushels per acre.

Fertiliser: 180 lb. superphosphate per acre.

Date of Sowing: 7th July, 1932. Variety "Lachlan" sown 26th July, 1932.

The yields were as follow:—

| Variety. | Yield. | | | | Percentage Yield Hay. |
|---|---|---|---|---|---|
| | tons | cwts. | qrs. | lbs. | |
| Algerian ... ... ... ... | 1 | 8 | 2 | 19 | 100 |
| Guyra ... ... ... ... | 1 | 7 | 2 | 25 | 96 |
| Burt's Early ... ... ... | 1 | 7 | 1 | 23 | 95 |
| Mulga ... ... ... ... | 1 | 9 | 2 | 14 | 103 |
| Lachlan * ... ... ... | 1 | 4 | 2 | 11 | 85 |

* Included in Experiment by the farmer, 1932.

The "Mulga" oats gave the best results under the existing conditions, being about 6 inches taller than the "Burt's Early." Neither of these two varieties tillered greatly.

The "Guyra" was slower in running up from the stool than the "Mulga" or "Burt's Early," but it was slightly ahead of the "Algerian" and tillered fairly well.

All the plots were very even in growth, the "Guyra" being a little shorter in the straw.

*G. E. White, Balingup.*

Soil: Very sandy loam.

Cultivation: Ploughed in June, cultivated and harrowed to seed bed.

Rate of Seeding: 2 bushels per acre.

Fertiliser: 1 bag superphosphate per acre.

Date of Sowing: 5th June, 1932.

The yields were as follow:—

| Variety. | Yield. | | | | Percentage Yield Hay. |
|---|---|---|---|---|---|
| | tons | cwts. | qrs. | lb. | |
| Algerian ... ... ... ... | 1 | 12 | 1 | 23 | 100 |
| Guyra ... ... ... ... | 2 | 10 | 0 | 26 | 146 |
| Burt's Early ... ... ... | 1 | 19 | 1 | 10 | 122 |
| Mulga ... ... ... ... | 2 | 2 | 0 | 15 | 131 |

The growth was very even throughout, but the date of sowing was apparently late for "Algerian."

The average of the 25 trials conducted throughout the South-West are shown in the following table:—

| Variety. | Yield. Average 70 plots—25 trials. | | | | Percentage Yield Hay. |
|---|---|---|---|---|---|
| | tons | cwts. | qrs. | lb. | |
| Algerian ... ... ... ... | 2 | 8 | 0 | 7 | 100 |
| Guyra ... ... ... ... | 2 | 3 | 3 | 15 | 91 |
| Lachlan ... ... ... ... | 2 | 2 | 0 | 7 | 87 |
| Burt's Early ... ... ... | 1 | 15 | 3 | 1 | 74 |
| Mulga ... ... ... ... | 1 | 15 | 2 | 13 | 74 |

## RELATIVE FOOD VALUES.

### RELATIVE VALUES OF CONCENTRATES.

PERTH, JUNE 1ST, 1933.

| Foodstuff. | Cost. | Cost per 100 lbs. | Starch equivalent per 100 lbs. | Digestible Protein per 100 lbs. | Cost per lb. of Starch equivalent. | Cost per lb. of Digestible Protein. |
|---|---|---|---|---|---|---|
| | | s. d. | | | d. | d. |
| Wheat ... | 3s. 3d. per bushel of 60 lbs. | 5 5 | 73 | 9·0 | 0·89 | 7·2 |
| Oats ... | 2s. 3d. per bushel of 40 lbs. | 5 7½ | 63 | 7·0 | 1·07 | 9·0 |
| Bran ... | £5 12s. 6d. per ton | 5 0 | 48 | 13·0 | 1·25 | 4·7 |
| Pollard ... | £5 17s. 6d. per ton | 5 3 | 61 | 13·5 | 1·03 | 4·7 |
| Linseed Meal | 14s. 6d. per 100lbs. | 14 6 | 72 | 25·5 | 2·42 | 7·0 |
| Meat Meal | 15s. 6d. per 100lbs. | 15 6 | 92 | 60·0 | 2·00 | 3·1 |
| Peas ... | 5s. per bushel of 60 lbs. | 8 4 | 74 | 19·0 | 1·35 | 5·3 |

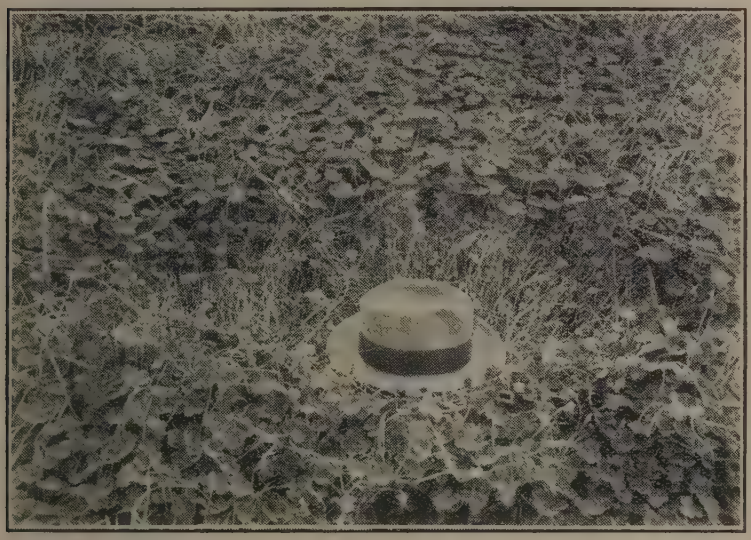
# KIKUYU GRASS.

H. G. Elliott, Agricultural Adviser, Dairy Branch.

Kikuyu Grass (*Pennisetum clandestinum Pilga*) was introduced into Australia from South Africa and is a native of the Belgian Congo. It is now well past its experimental stages in this State, and is grown extensively as a pasture plant and to some extent as a lawn grass.

In Western Australia, as well as the other States of the Commonwealth, Kikuyu has not exhibited any signs of forming seed, although flowering has been recorded; consequently it has to be propagated by means of "roots" or cuttings.

Kikuyu Grass is a perennial running grass with branching leafy stems which form a dense turf similar to couch grass. The leaves are flat and spreading. It has numerous stout rhizomes nearly as thick as a lead pencil, and by means of these, and the above ground runners, a single plant will soon cover an area of several square yards. On rich soil, in the presence of sufficient moisture, it will grow to the height of three feet, but the stems at the base become very decumbent, thereby forming a dense mat, so that the lower leaves soon die.



Subterranean Clover and Kikuyu Grass growing at Harvey under irrigation.
(*Photo. by G. N. Lowe.*)

This grass, being a vigorous grower, naturally draws heavily on the available plant food in the soil, adequate fertilisation, therefore, being necessary to maintain vigorous growth. Being a tropical grass, the growing period is during the summer months, provided moisture is present. It remains green during the winter and starts to grow vigorously with the advent of the warm weather in the spring. Its drought resistant qualities are equal to if not better than those of most of the perennial grasses.

An important characteristic of Kikuyu is its capability of growing in conjunction with clovers. In New Zealand good results are obtained by surface sowing a mixture of White and Red Clover and Lotus major after the Kikuyu cuttings have been set. In South Africa, Kikuyu and White Clover are described as "ideal pasture," and it is found that any clover will grow in conjunction with Kikuyu Grass. Experience in Western Australia also shows that clovers will grow in conjunction with Kikuyu. Where it has been planted on old Subterranean pastures in the irrigation areas and elsewhere, the two are now growing together with excellent results, as illustrated in the above photograph. The nutritive value of Kikuyu and clover is about the same as that of lucerne, but lucerne would not give the same bulk.

Kikuyu Grass is naturally suited for pastures. It is a perennial, and spreads quickly by means of above and below ground runners. The above ground runners carry large quantities of leaf, thereby providing a bulk of fodder. The grass grows very rapidly and has the power of rooting at every joint, forming a dense turf which will stand heavy tramping and severe "rooting" by pigs. This turf-forming habit is a most important factor from a grazing point of view. Tussocky grasses become tramped and eaten out more readily than "turf" grasses; also they do not cover the ground completely, consequently bare patches occur, allowing weeds to become established which ultimately smother the more valuable pasture plants.

In Western Australia Kikuyu has adapted itself readily to most of our soils under varying climatic conditions. It can be found growing on sand, loam, clay loam, gravelly sand, and heavy clay soil with excellent results, but appears to thrive best on rich summer moist soils or where irrigation can be supplemented. It is not a swamp grass, but has been observed in this State to withstand the effects of flooding for five months, and in November, when the water receded, green shoots immediately made their appearance, producing an abundance of feed.

As Kikuyu does not produce seed in the South-West of this State, the only method of propagation is by means of cuttings. The crowns of well rooted plants are divided, and the rooted running stems and "roots" are cut so that for planting the piece is not more than six inches long. If large areas are to be planted, the land should be ploughed and brought into good condition. At planting time plough again, and in every third or fourth furrow set the cuttings at a distance of about 2½ to 3 feet apart in the furrow. At the rate 5,000 to 6,000 sets are required per acre. When setting, great care should be taken, as only about two-thirds of the cutting should be covered by the soil. Where small areas are to be planted, or the land is too rough for ploughing, the cuttings are hoed in. Care should be taken to firm the soil around each piece as it is set.

The best time of planting is during the spring or early summer months, but it can be planted in the autumn as late as the end of April. A cheap method of establishment is to plant the cuttings between rows of maize after the last intercultivation has taken place.

At the time of planting a dressing of 1½ to 2 cwts. of superphosphate is advisable, and topdressing should be carried out in the autumn with superphosphate and ammonia No. 3 at the rate of 1½ cwts. per acre, with a further application of 1½ cwts. of superphosphate in the spring.

With bad management, after about four years Kikuyu is likely to become sod bound, and then its yield of top growth will decrease. When this occurs ploughing is necessary. The proper use of fertilisers, efficient grazing, and the use of disc harrows or paspalum renovators annually will prevent this sod-bound condition occurring.

Kikuyu Grass makes a very dense growth, being at first erect, but, when the height of 12 to 18 inches is reached, it lodges as the stems at the base become very decumbent, consequently it is not very well suited for hay-making. Hay made from this grass is palatable and highly nutritious but has not a sweet odour, and is difficult to cure on account of the thick stems.

Kikuyu can be regarded as a most palatable grass, but there are some grasses which are more so. Palatability tests carried out with cows in New South Wales showed that Kikuyu is more palatable than Cocksfoot, Timothy, and Rhodes Grass, while the Hungarian Brome was more palatable than the Kikuyu. Similar experiments were carried out in South Africa which showed that *Phalaris tuberosa* was more palatable than Kikuyu Grass mixed with clover which, however, was second on the list.

In New South Wales excellent results are obtained with Kikuyu for controlling Bracken Fern. The following method is adopted:—

The land is well worked prior to planting in the spring; the fern fronds cut in the early spring, and the grass planted in rows 3 feet apart with 3 feet between the cuttings. Fertiliser used, 1½ cwts. superphosphate per acre. The Kikuyu makes rapid headway—by the following spring a mat of grass has formed and the fern is gradually choked out.

The following table shows the analyses of Kikuyu Grass compared with Sudan Grass and Japanese Millet:—

PERCENTAGE COMPOSITION.

| — | Moisture. | Crude Protein. | Crude Fat. | Carbohydrate. | Crude Fibre. | Ash. | Authority. |
|---|---|---|---|---|---|---|---|
| Kikuyu (18 inches high) | 7·6 | 17·4 | 1·1 | 42·4 | 22·1 | 9·4 | W. Aus. Gov. Anal. |
| Kikuyu ... ... | ... | 15·3 | 2·2 | 36·3 | 33·1 | 13·0 | Wollongbar, N.S.W. |
| Kikuyu ... ... | ... | 14·5 | 2·0 | 34·4 | 34·7 | 14·4 | Grafton, N.S.W. |
| Sudan Grass (in flower) | 6·7 | 10·9 | 1·7 | 48·3 | 24·5 | 8·0 | Jeffries, Sth. Aus. |
| Sudan Grass 2 feet high) | ... | 16·4 | 3·7 | 37·4 | 25·8 | 16·7 | Guthrie, N.S.W. |
| Japanese Millet (Ears peeping) | ... | 13·3 | 2·3 | 40·2 | 29·7 | 14·4 | Guthrie, N.S.W. |

*Conclusions.*

1. As Kikuyu does not seed in the South-West of Western Australia, the means of propagation is by cuttings, or division of the crown.
2. It is not affected by frost in the dairying districts.
3. It grows on almost any class of soil but thrives best on fertile soil.
4. As it does not seed, it should be easily kept in check.
5. It should be valuable in Bracken Fern country.
6. It is a valuable pasture and lawn grass but unsuited for hay purposes.
7. It appears naturally adapted to grow with legumes.
8. Spring and early summer planting are recommended.

# HERD TESTING.

## THE OFFICIAL AUSTRALIAN PURE BRED DAIRY CATTLE PRODUCTION TESTING SCHEME.

Conducted by Dairy Branch, Department of Agriculture. 1932-33.

Incomplete—the final results for the year ending 30th June, 1933, will be published in the September Journal.

### MATURE COWS (OVER 5 YEARS OLD)—STANDARD 350 Lbs. BUTTER FAT.

| Name of Cow. | Breed. | Date of Birth. | Herd Book No. | Date of Calving. | No. of Days in Test. | Weight of Milk Last day of Test. | Weight of Milk for period. | Average Test. | Butter Fat. | Owner. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | lb. | lb. | % | lb. | | |
| Koojan Bonnie Jean ... ... | Guernsey | 28-3-26 | 1612 | 23-4-32 | 273 | 19 | 9,042 | 6·04 | 543·88 | A. W. Padbury ... | Robin of Nundorah |
| Pansy 5th of the Hill ... ... | A.I.S. ... | 2-2-25 | 15729 | 18-5-32 | 273 | 25½ | 13,591 | 4·00 | 543·16 | D. Bevan ... ... | Crescent of the Hill |
| Brookvale Noble Queen ... | Jersey ... | 24-6-26 | 24895 | 6-7-32 | 273 | 19 | 9,942 | 4·80 | 480·33 | G. F. Combs ... | Noble Lad of Roelands |
| Glanavon Jenny ... ... | A.I.S. ... | 1926 | Vol. 8 | 2-11-31 | 273 | 23 | 10,449 | 4·68 | 470·37 | D. Bevan ... ... | (foundation) |
| Kurrawong Kitty 8th ... ... | do. ... | 6-8-26 | 16030 | 12-2-32 | 273 | 36 | 10,293 | 4·58 | 459·12 | W. G. Burges ... | Premier of Kurrawong |
| Kurrawong Kathleen 5th ... | do. ... | 13-12-25 | 16027 | 24-6-32 | 273 | 26 | 11,328 | 4·10 | 456·77 | W. G. Burges ... | do. do. |
| Matilda 7th of Berry ... ... | do. ... | 15-1-24 | 14074 | 31-1-32 | 273 | 30 | 9,960 | 4·53 | 452·65 | W. G. Burges ... | Rutland of Darbalara |
| Koojan Bonnie Elizabeth ... | Guernsey | 23-3-27 | 1899 | 7-4-32 | 273 | 19 | 7,452 | 5·9 | 443·05 | A. W. Padbury ... | Robin of Nundorah |
| Hope 3rd of the Hill ... ... | A.I.S. ... | 6-1-25 | 15710 | 20-7-32 | 273 | 19 | 10,932 | 4·0 | 440·12 | W. G. Burges ... | Crescent of the Hill |
| Koojan Wavelet ... ... | Guernsey... | 7-8-26 | 1619 | 3-10-31 | 273 | 23 | 8,364 | 5·2 | 436·88 | A. W. Padbury ... | Robin of Nundorah |
| Yanmah Pearl 2nd ... ... | A.I.S. ... | 15-4-25 | 1 M.S. | 16-7-32 | 273 | 21½ | 9,769 | 4·5 | 436·84 | J. C. Phillips ... | Rostellan Knight of Yanmah |
| Grassvale Golden Cream 2nd ... | Jersey ... | 23-4-26 | 24926 | 19-7-32 | 273 | 16½ | 7,474 | 5·62 | 421·67 | R. H. Rose ... ... | Rye Duke of Glen Iris |
| Koojan Dame ... ... ... | Guernsey | 18-6-24 | 1252 | 16-6-32 | 273 | 26 | 10,428 | 4·1 | 416·72 | Denmark State Farm | Robin of Nundorah |
| Koojan Mordern Lady 2nd ... | do. ... | 11-8-22 | 918 | 27-12-31 | 273 | 20½ | 8,431 | 4·88 | 409·95 | A. W. Padbury ... | Gay Lad's Golden Dawn |
| Koojan Lady Betty 4th ... | do. ... | 22-5-26 | 1616 | 11-2-32 | 273 | 16 | 8,913 | 4·56 | 408·36 | A. W. Padbury ... | Robin of Nundorah |
| Boo-Peep of Greenmount ... | Jersey ... | 24-6-25 | 20902 | 30-7-32 | 273 | 21½ | 7,894 | 5·10 | 403·87 | A. J. B. Strempel ... | Werribee Starbright King |
| Moorlands April ... ... ... | do. ... | 3-9-26 | 23687 | 16-5-32 | 273 | 14½ | 7,663 | 5·20 | 399·17 | P. Rose ... ... | Colonel of Melrose |
| Kurrawong Royal Lady ... | A.I.S. ... | 6-4-25 | 16049 | 21-1-32 | 273 | 32 | 10,035 | 3·98 | 398·49 | W. G. Burges ... | Count Hughes |
| Claremont Pentland Blossom 6th | do. ... | 2-7-27 | 17926 | 13-7-32 | 273 | 18 | 9,864 | 4·0 | 397·03 | Hospital for Insane ... | Telyarup Prince of Claremont |
| Grassvale Cream Duchess ... | Jersey ... | 24-9-23 | 17531 | 29-5-32 | 273 | 15 | 7,770 | 5·03 | 390·97 | R. H. Rose ... ... | Rye Duke of Glen Iris |
| Numbawarra Lulu ... ... | A.I.S. ... | 21-9-26 | 4022 | 22-3-32 | 273 | 19 | 9,927 | 3·86 | 385·70 | W. G. Burges ... | Fairy's Jock of Fairfield |
| Brookvale Noble Lily ... ... | Jersey ... | 19-8-26 | 24894 | 7-7-32 | 273 | 16 | 7,803 | 4·80 | 373·81 | G. F. Combs ... | Noble Lad of Roelands |
| Greenmount Charming Bells 2nd | do. ... | 12-3-26 | 23708 | 9-6-32 | 273 | 18 | 6,684 | 5·48 | 367·18 | A. J. B. Strempel ... | Cheer-up of Hamel-Lea |
| Wooroloo Redwings ... ... | A.I.S. ... | 1-11-23 | 15148 | 8-5-32 | 273 | 23 | 8,709 | 4·20 | 364·90 | Wooroloo Sanatorium Farm | Commercial of Blackheath |
| Colmyn's Lady ... ... ... | Jersey ... | 31-1-27 | 23667 | 4-8-32 | 273 | 12½ | 7,137 | 5·20 | 364·64 | C. H. Ironmonger ... | Roeland's Milord |
| Capel Lass ... ... ... | do. ... | 1-8-25 | 24906 | 8-5-32 | 273 | 19 | 7,892 | 4·6 | 363·55 | B. W. Prowse ... | Brown Fern of Glen Iris |
| Wooroloo Wing Wing ... ... | A.I.S. ... | 2-5-26 | Vol. 8 | 25-5-32 | 273 | 18 | 8,206 | 4·26 | 349·57 | Wooroloo Sanatorium Farm | Eclipse of Wooroloo |
| Denmark Anne ... ... ... | Guernsey ... | 2-3-23 | 1164 | 27-6-32 | 273 | 14 | 7,287 | 4·80 | 343·25 | Denmark Stud Farm | Linwood of Wollongbar |
| Moorlands Bebe ... ... ... | Jersey ... | 21-4-27 | 24912 | 31-5-32 | 240 | 9 | 7,365 | 4·60 | 339·27 | P. Rose ... ... | Grafter of Melrose |
| Dahlia 4th of Raleigh ... ... | A.I.S. ... | 2-12-26 | 17470 | 1-8-32 | 210 | 24 | 9,770 | 3·40 | 334·65 | D. Bevan ... ... | Union Jack of Raleigh |
| Favourite 3rd of Roelands ... | Jersey ... | 23-2-25 | 16856 | 5-8-32 | 273 | 14½ | 7,418 | 4·60 | 334·09 | B. W. Prowse ... | Noble Duke of Glen Iris |
| Moorlands Ada ... ... ... | do. ... | 25-5-26 | 23679 | 23-4-32 | 240 | 15 | 6,165 | 5·4 | 329·73 | P. Rose ... ... | Colonel of Melrose |
| Glanavon Daisy ... ... ... | A.I.S. ... | 1926 | Vol. 8 | 2-2-32 | 273 | 27 | 10,401 | 3·25 | 325·92 | D. Bevan ... ... | (foundation) |
| Colleen of Rosewood ... ... | Guernsey... | 30-1-22 | 819 | 22-12-31 | 273 | 19 | 6,537 | 4·90 | 324·36 | Denmark Stud Farm... | Archer of Nundorah |
| Carnation of Minathorpe ... | A.I.S. ... | 6-3-26 | ... | 29-11-31 | 273 | 21 | 6,993 | 4·8 | 311·84 | R. Bee ... ... ... | Bruce of Sunnyvale |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Moorlands Hazel ... ... | Jersey ... | 29-7 25 | 20891 | 16-7-32 | 240 | 13½ | 6,615 | 4·67 | 308·37 | P. Rose ... ... | Hope of Moorlands |
| Denmark Rosa 2nd ... ... | Guernsey | 6 2 27 | 1793 | 11 4 32 | 273 | 17½ | 6,397 | 4·57 | 305·20 | Denmark Stud Farm... | Rose Chief of Wollongbar |
| Wollongbar Dinah 2nd ... | do. ... | 13-2 32 | 832 | 7-12-31 | 273 | 12 | 6,486 | 4·58 | 295·20 | Denmark Stud Farm... | Judge of Wollongbar |
| Spurfield Air Girl 2nd ... ... | do. ... | 22 4-24 | 1048 | 4 11-31 | 273 | 15 | 5,325 | 5·38 | 285·53 | Muresk Aaricultural College | Milton's Steadfast |
| Mayfield Sunol 2nd ... ... | A.I.S.... ... | 11-20 | 12820 | 23-11 31 | 273 | 21 | 7,683 | 3·65 | 280·85 | D. Bevan ... ... | Masher of Mayfield |
| Mokine Empire Lily 9th ... | Jersey ... | 25-5 26 | ... | 7 1 32 | 273 | 10 | 5,100 | 5·40 | 271·59 | T. H. Wilding ... | Mokine The Hood |
| Betty 2nd of Wollongbar ... | Guernsey... | 4 7 26 | 1571 | 15-5-32 | 273 | 13 | 5,394 | 5·00 | 267·47 | Muresk Agricultural College | Bounty of Wollongbar |
| Dahlia 5th of Berry ... ... | A.I.S. ... | 23 2-24 | 15545 | 2-5-32 | 150 | 36 | 6,780 | ... | 250·38 | D. Bevan ... ... | Mirth of Berry |
| Blanche 6th of Claremont ... | do. ... | 6-1 26 | 17910 | 4-11-31 | 180 | 13 | 6,180 | 3·98 | 242·10 | Claremont Hospital for Insane | Telyarup Prince of Claremont |
| Moorlands Lydia ... ... | Jersey ... | 22-12 24 | 19107 | 12 5-32 | 120 | 40½ | 5,197 | ... | 241·39 | P. Rose ... ... | Top Notch of Roelands |
| Muresk Lily ... ... ... | Guernsey.. | 16-2 27 | 1801 | 6-4 32 | 273 | 11½ | 4,339 | 5·27 | 228·68 | Muresk Agricultural College | Triumph of Wollongbar |
| Springmead Lady Osram ... | Jersey ... | 2 11-23 | 18295 | 18-12-31 | 273 | 14 | 5,202 | 4·27 | 222·13 | Sabina Vale Stud Farm | Springmead Osram |
| Denmark Red Rose 2nd ... | Guernsey... | 31-10 26 | 1792 | 10-12 31 | 210 | 14½ | 3,975 | 5·07 | 202·44 | Denmark Stud Farm | Rose Chief oi Wollongbar |
| Yannah Snowdrop ... ... | A.I.S. ... | 15-5 27 | ... | 29 5-32 | 150 | 20½ | 4,665 | ... | 183·06 | J. C. Phillips ... | Rostellan Knight of Yannah |
| Daphne 7th of the Hill ... | do. ... | 15 5-26 | 15697 | 22 10-32 | 30 | 57 | 1,710 | ... | 74·88 | W. G. Burges ... | Crescent of the Hill |

COWS OVER 4 YEARS 6 RONTHS AND UNDER 5 YEARS STANDARD 330 LBS. BUTTER FAT.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sally of the Hill ... ... | A.I.S. ... | 8-10-27 | 15741 | 20-6-32 | 273 | 29 | 12,207 | 4·00 | 497·89 | W. G. Burges ... | Crescent of the Hill |
| Gold 11th of Raleigh ... ... | do. ... | 16 10 27 | 17507 | 25 6-32 | 273 | 23 | 11,094 | 4·07 | 447·77 | D. Bevan ... ... | Royal Standard at Darbalara |
| Koojan Ida ... ... ... | Guernsey | 3-2-27 | 1500 | 15-9-31 | 273 | 26 | 7,403 | 5·40 | 403·29 | A. Padbury ... ... | Robin of Nundorah |
| Do. ... ... ... | do. ... | 3-2-27 | 1900 | 15-9-31 | 365 | 23 | 9,609 | 5·66 | 544·13 | A. Padbury ... ... | do. do. |
| Picture 8th of Raleigh ... | A.I.S. ... | 22 4 27 | 17524 | 5 12-31 | 273 | 31 | 10,698 | 3·80 | 388·74 | D. Bevan ... ... | Union Jack of Raleigh |
| Moorlands Blot ... ... ... | Guernsey | 27 8 27 | 21917 | 6 5-32 | 240 | 14½ | 6,720 | 5·10 | 343·32 | P. Rose ... ... | Zenith of Moorlands |
| Moorlands Blur ... ... ... | Jersey ... | 8-9-27 | 24918 | 14-5-32 | 240 | 13½ | 6,540 | 4·86 | 316·05 | P. Rose ... ... | Grafter of Melrose |
| Glanavon's Famous Star ... | A.I.S. ... | 30-8-27 | 2332 | 24-6-32 | 210 | 9 | 7,065 | 3·90 | 278·67 | D. Bevan ... ... | Premier of Blackheath |

COWS OVER 4 YEARS AND UNDER 4 YEARS 6 MONTHS—STANDARD 310 LBS. BUTTER FAT.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Karawarra Plum 3rd ... ... | A.I.S. ... | 27-4-28 | 1261 | 10-6-32 | 273 | 32 | 10,956 | 3·80 | 422·67 | W. G. Burges ... | Sailor of Karawarra |
| Star of Claremont ... ... | do. ... | 15 2-27 | 17928 | 9 10 31 | 273 | 8½ | 10,480 | 3·90 | 409·64 | Claremont Hospital for Insane | Telyarup Prince of Claremont |
| Juadive Belvedere ... ... | Jersey ... | 12-5-28 | 28180 | 29-6-32 | 273 | 15 | 7,320 | 5·56 | 406·27 | Miss Hancock ... | Mokine Hero |
| Brushgrove Tulip 2nd ... ... | A.I.S. ... | 3 7 27 | 18109 | 5 12 31 | 273 | 41½ | 10,579 | 3·77 | 379·41 | E. C. Melville ... | Ardee of the Hill |
| Greenmount Bonnie Lass ... | Jersey ... | 23 3-28 | 28237 | 19-5-32 | 273 | 18 | 6,474 | 5·59 | 360·27 | A. J. B. Strempel ... | Werribee Starbright King |
| Banyule Velveteen 12th ... | do. ... | 11-9 27 | 24474 | 14 10 31 | 273 | 20 | 6,600 | 5·39 | 355·19 | Sabina Vale Stud Farm | Wotton Airman |
| Claremont Pentland Blossom 7th | A.I.S. ... | 21 4 28 | 2415 | 14 7 32 | 273 | 17 | 8,286 | 4·16 | 345·93 | Claremont Hospital for Insane | Telyarup Prince of Claremont |
| Folly of Aorangi ... ... | do. ... | 18 6-27 | 17064 | 20 9-31 | 240 | 21½ | 9,570 | 3·58 | 343·10 | E. C. Melville ... | General Maud of Aorangi |
| Moorlands Chloe ... ... | Jersey ... | 2-5 28 | 28214 | 17-6-32 | 210 | 17½ | 6,180 | 5·61 | 340·59 | P. Rose ... ... | Colonel of Melrose |
| Clarendon Eyre Betty ... ... | do. ... | 28 4 28 | Vol. 20 | 26 5 32 | 273 | 21½ | 7,794 | 4·30 | 338·08 | Sabina Vale Stud Farm | Clarendon Eyre Eminents Achievement |
| Springpark Dora ... ... | do. ... | 6-3-28 | 24900 | 10-4-32 | 273 | 14½ | 5,868 | 5·44 | 319·76 | C. H. Ironmonger ... | PrinceMarinora of G. |
| Mokine Empire Lily 12th ... | do. ... | 30-11-27 | ... | 23-12-32 | 273 | 11 | 4,503 | 6·95 | 312·86 | T. H. Wilding ... | Noble's Best of G. Hill |
| Muresk Rose ... ... ... | Guernsey | 9-5 28 | 2156 | 2-8-32 | 273 | 12 | 5,931 | 5·10 | 307·14 | Muresk Agricultural College | Triumph of Wollongbar |
| Claremont Poppy 2nd ... ... | A.I.S. ... | 17-1 28 | 2420 | 13 6 32 | 273 | 16 | 6,883 | 4·40 | 302·53 | Claremont Hospital for Insane | Telyarup Prince of Claremont |
| Muresk Pansy ... ... ... | Guernsey... | 10-6-27 | 1802 | 6-11-31 | 273 | 18 | 5,529 | 5·48 | 301·73 | Muresk Agricultural College | Triumph of Wollongbar |

HERD TESTING—*continued.*

| Name of Cow. | Breed. | Date of Birth. | Herd Book No. | Date of Calving. | No. of Days in Test. | Weight of Milk Last day of Test. | Weight of Milk for period. | Average Test. | Butter Fat. | Owner. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | lb. | lb. | % | lb. | | |
| **COWS OVER 4 YEARS AND UNDER 4 YEARS 6 MONTHS—STANDARD 310 LBS. BUTTER FAT—*continued.*** | | | | | | | | | | | |
| Valerie of Aorangi ... ... | A.I.S. ... | 14-7 27 | 17086 | 20 9-31 | 240 | 10½ | 6,915 | 4·33 | 298·89 | E. C. Melville ... | General Maud of A. |
| Moorlands Cherry ... ... | Jersey ... | 2 5-28 | 28213 | 12-6 32 | 240 | 8½ | 5,910 | 5·00 | 295·26 | P. Rose ... ... | Colonel of Melrose |
| Moorlands Beckie ... ... | do. ... | 11 8 27 | 24913 | 9-2-32 | 240 | 21½ | 5,460 | 5·4 | 294·33 | P. Rose ... ... | Moorlands Zenith |
| Minnamurra Confetti ... ... | Guernsey | 20-7 27 | 1859 | 27-10-31 | 273 | 16 | 4,443 | 5·75 | 253·35 | Muresk Agricultural College | Judge of Wollongbar |
| Grassvale Lady Fowler 9th ... | Jersey ... | 17 6-28 | ... | 12-9 32 | 210 | 12 | 4,680 | ... | 239·67 | R. H. Rose ... ... | Mokine Christopher Columbus |
| Springmead Island Rose ... | do. ... | 9-3 28 | 27214 | 7-7 32 | 273 | 7½ | 5,032 | 4·4 | 223·13 | Sabina Vale Stud Farm | Springmead Islander |
| Viola 2nd of Wangara ... ... | A.I.S. ... | 23-8-27 | 17886 | 26-10-31 | 210 | 8 | 3,990 | 4·26 | 170·34 | A. E. Grant ... ... | Limelight of Darbalara |
| Tipperary Matilda ... ... | do. ... | 2 4 28 | 17901 | 1-5 32 | 120 | 25½ | 3,675 | ... | 147·90 | A. E. Grant ... ... | Villiers of Darbalara |
| Juadine Sparkle 2nd ... ... | Jersey ... | 4-6 28 | ... | 24 7-32 | 60 | 37 | 2,070 | ... | 99·60 | Miss Hancock ... | Mokine Hero |
| **COWS OVER 3½ YEARS AND UNDER 4 YEARS—STANDARD 290 LBS. BUTTER FAT.** | | | | | | | | | | | |
| Yallah Farm Maggie 2nd ... | A.I.S. ... | 30-8 28 | 1272 | 22-7-32 | 273 | 31 | 13,233 | 3·90 | 508·87 | W. G. Burges ... | Fussy's Favour of Park View |
| Karridale Queen ... ... | Guernsey | 27 11 28 | 2754 | 9-8-32 | 273 | 25 | 9,360 | 5·30 | 493·95 | G. E. Scott ... ... | Minnamurra Oliver Twist |
| Newry Lady Freeda ... ... | do. ... | 13 9-28 | 2719 | 19 6 32 | 273 | 19 | 7,302 | 6·02 | 433·80 | G. E. Scott ... ... | Koojan Mack |
| East View Gwen 2nd ... ... | A.I.S. ... | 1 9-28 | 18337 | 15-5-32 | 273 | 27½ | 12,967 | 3·31 | 430·77 | A. E. Grant ... ... | Marinor of Greyleigh |
| Karridale Lady Betty ... ... | Guernsey... | 19 9 28 | 2331 | 10-6 32 | 273 | 20½ | 7,381 | 5·20 | 386·94 | G. E. Scott ... ... | Minnamurra Oliver Twist |
| Karawarra Champion 2nd ... | A.I.S. ... | 6 5-28 | 1253 | 28 3 32 | 273 | 30 | 9,750 | 3·98 | 384·80 | W. G. Burges ... | Sailor of Karawarra |
| Cherry 2nd of Claremont ... | do. ... | 8-2-28 | 2394 | 8-10 31 | 273 | 19 | 8,637 | 4·40 | 378·85 | Claremont Hospital for Insane | Telyarup Prince of Claremont |
| Koojan Polly ... ... ... | Guernsey... | 13 12 28 | 2665 | 13 9 32 | 273 | 17 | 6,961 | 5·40 | 377·46 | A. W. Padbury ... | Koojan Golden Governor |
| Mokine Twylish Lass ... ... | Jersey ... | 29 11-28 | 34845 | 21 6 32 | 273 | 14 | 5,628 | 6·40 | 359·52 | T. H. Wilding ... | The Valley Twylish Fox |
| Denmark Rose Pearl 3rd ... | Guernsey... | 20 11-27 | 1798 | 25-10 31 | 273 | 14 | 6,027 | 5·95 | 357·57 | Denmark Stud Farm | Rose Chief of Wollongbar |
| Mavis 2nd of Claremont ... | A.I.S. ... | 3 3 28 | 2411 | 28 10 31 | 273 | 25 | 8,025 | 4·00 | 321·79 | Claremont Hospital for Insane | Telyarup Prince of Claremont |
| Moorlands Clara ... ... | Jersey ... | 18 8 28 | 28215 | 10 6 32 | 240 | 13 | 6,075 | 5·10 | 308·46 | P. Rose ... ... | Grafter of Melrose |
| Moorlands Ceres ... ... | do. ... | 17-5 28 | 28211 | 3-5 32 | 240 | 10½ | 5,535 | 5·50 | 307·23 | P. Rose ... ... | Colonel of Melrose |
| Muresk Daisy ... ... ... | Guernsey | 16 6-28 | 2155 | 9 5 32 | 273 | 18 | 6,764 | 4·44 | 299·46 | Muresk Agricultural College | Triumph of Wollongbar |
| Moorlands Camilla ... ... | do. ... | 4-7 28 | 28207 | 13-6 32 | 240 | 12½ | 6,025 | 4·84 | 290·67 | P. Rose ... ... | Colonel of Melrose |
| Moorlands Corona ... ... | Jersey ... | 15 11-28 | 28223 | 28 6 32 | 210 | 16 | 5,220 | 5·55 | 279·66 | P. Rose ... ... | Romeo of Melrose |
| Moorlands Celia ... ... ... | do. ... | 17-5 28 | 28210 | 3-5 32 | 240 | 11½ | 5,475 | 5·00 | 277·78 | P. Rose ... ... | Colonel of Melrose |
| Colmyn's Princess Marinora ... | do. ... | 15 5 28 | 24897 | 2-3 32 | 273 | 16½ | 4,749 | 5·7 | 271·17 | C. H. Ironmonger ... | Prince Marinora of Grass Vale |
| Springmead Fern ... ... | do. ... | 5 3-28 | 27213 | 21 11 31 | 273 | 7½ | 5,392 | 4·88 | 263·83 | Sabina Vale Stud Farm | Springmead Islander |
| Lady Jean 4th of Jerrara Park | A.I.S. ... | 30 11 27 | 13012 | 19 10 31 | 210 | 22 | 7,020 | 3·73 | 261·66 | E. C. Melville ... | Tulip's Hero of Hill View |
| Minathorpe Carnation 4th ... | do. ... | 2-8 28 | 2475 | 25 2 32 | 273 | 17 | 6,216 | 4·19 | 260·26 | R. Bee ... ... | Collier of Darbalara |
| Wooroloo Gem 3rd ... ... | do. ... | 25 12 28 | 2519 | 17 9 32 | 180 | 17 | 5,055 | 4·30 | 217·47 | Wooroloo Sanatorium Farm | Triumph of Pine Creek |
| Telyarup Milkmaid 2nd ... | do. ... | 15 10 28 | 2505 | 3 5 32 | 240 | 7½ | 5,475 | 3·48 | 190·29 | A. E. Grant ... ... | Baron of Darbalara |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tipperary Virginia ... ... | do. ... | 7 2 28 | 17905 | 6 4–32 | 150 | 24 | 3.915 | ... | 160·47 | A. E. Grant ... ... | Villiers of Darbalara |
| Glanavon Sunbeam ... ... | do. ... | 2 2 29 | 2368 | 6–10–32 | 60 | 28½ | 1,770 | ... | 69·69 | D. Bevan ... ... | Pine Creek of Dunbar |
| Liberton Patricia ... ... | do. ... | 1-1-29 | 2441 | 8–8–32 | 30 | 37½ | 1,125 | ... | 36·45 | A. E. Grant ... ... | Limit of East View |

OVER 3 YEARS OLD AND UNDER 3½ YEARS—STANDARD 270 LBS. BUTTER FAT.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Banyule Silvermine 55th ... | Jersey ... | 2-8 28 | 25.473 | 22-11-31 | 273 | 20½ | 7,726 | 5·65 | 435·66 | Sabina Vale Stud Farm | Air Lord of Banyule |
| Bella 3rd of the Hill ... ... | A.I.S. ... | 13-5-28 | 15.690 | 27–10–31 | 273 | 26 | 9,168 | 4·23 | 381·48 | W. G. Burges ... | Crescent of the Hill |
| Capel Favourite ... ... ... | Jersey ... | 1-3-29 | 31211 | 17 5 32 | 273 | 18½ | 6,745 | 5·13 | 346·18 | B. W. Prowse ... | Bracken Fern of Roelands |
| Grassvale Sweet Maggie 2nd ... | do. ... | 27–3 29 | 28229 | 17–7–32 | 273 | 13½ | 6,345 | 5·18 | 326·80 | R. H. Rose ... ... | Starbright S.D. of G.I. |
| Koojan Bonnie Buttercup ... | Guernsey... | 18 10 28 | 2230 | 5–4–32 | 273 | 11 | 5,958 | 5·20 | 311·66 | A. W. Padbury ... | Koojan Golden Governor |
| Koojan Daffodil ... ... ... | do. ... | 4–10–28 | 2231 | 4 12–31 | 273 | 14½ | 5,293 | 5·90 | 311·42 | A. W. Padbury ... | Koojan Golden Governor |
| Flash of East View ... ... | A.I.S. ... | 4-10 28 | 18331 | 7–12–31 | 273 | 20 | 8,145 | 3·80 | 305·44 | A. E. Grant ... ... | Marinor of Greyleigh |
| Glenoshea Ada ... ... ... | Jersey ... | 23 8 28 | 28402 | (Vict.) | 273 | 19½ | 6,433 | 4·69 | 300·36 | Sabina Vale Stud Farm | Burnside Mooltan |
| Blanche 6th of Minathorpe ... | A.I.S. ... | 13-6 28 | 17937 | 8–12–31 | 273 | 21 | 6,723 | 4·50 | 294·54 | R. Bee ... ... | Collier of Darbalara |
| Greenmount Gipsy Lass ... | Jersey ... | 6 3 29 | 28239 | 4 6 32 | 273 | 12½ | 4,747 | 6·12 | 290·12 | A. J. B. Strempel ... | Werribee Starbright King |
| Moorlands Doris ... ... | do. ... | 14 5 29 | 31235 | 1–6 32 | 210 | 15 | 5,925 | 4·80 | 285·93 | P. Rose ... ... | Moorlands Romeo |
| Greenmount Gipsy Maid ... | do. ... | 8–3 29 | 28240 | 2–5–32 | 273 | 12 | 4,716 | 5·71 | 268·41 | A. J. B. Strempel ... | Werribee Starlight King |
| Telyarup Thelma 2nd ... ... | A.I.S. ... | 22–11–28 | 2506 | 5 5–32 | 240 | 8½ | 6,090 | 4·43 | 266·22 | A. E. Grant ... ... | Baron of Darbalara |
| Greenmount Snowflake ... | Jersey ... | 30 3 29 | 28242 | 15 5–32 | 273 | 11 | 5,073 | 5·29 | 264·47 | A. J. B. Strempel ... | Werribee Starbright King |
| Moorlands Colleen ... ... | do. ... | 1 12 28 | 28219 | 15–2–32 | 273 | 17 | 5,631 | 4·49 | 251·80 | P. Rose ... ... | Moorlands Plato |
| Tipperary Royal Lady ... ... | A.I.S. ... | 13-11-29 | 2377 | 17–11–31 | 273 | 9 | 4,677 | 4·3 | 203·90 | R. Bee ... ... | Tipperary Melba's Re-Echo |
| Belle 6th of Claremont ... | do. ... | 29-9-28 | 2336 | 21–1–32 | 180 | 12½ | 4,785 | ... | 199·79 | Claremont Hospital for Insane | Clinker of Claremont |
| Colmyns Borona Rye ... ... | Jersey ... | 23 4 29 | 31188 | 23–7–32 | 240 | 7½ | 3,875 | ... | 172·28 | C. H. Ironmonger ... | Rye Duke of Glen Iris |
| Colmyns Rye Cream ... ... | do. ... | 16 11-28 | 28193 | 7–2 31 | 150 | 6½ | 1.530 | 5·40 | 88·20 | C. H. Ironmonger ... | Rye Duke of Glen Iris |

COWS OVER 2½ YEARS AND UNDER 3 YEARS—STANDARD 250 LBS. BUTTER FAT.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Koojan Polly ... ... ... | Guernsey... | 13 12 28 | 2665 | 21–10 31 | 273 | 17 | 7,041 | 5·18 | 363·17 | A. W. Padbury ... | Koojan Golden Governor |
| Banyule Silvermine 66th ... | Jersey ... | 10-9-29 | ... | 29–3–32 | 273 | 17½ | 6,217 | 5·79 | 358·70 | Sabina Vale Stud Farm | Milkmaid Chief of Banyule |
| Claremont Belle 9th ... ... | A.I.S. ... | 25–8 29 | 2388 | 4–5 32 | 273 | 23 | 8,259 | 4·10 | 340·03 | Claremont Hospital for Insane | Claremont Evan |
| Nooka Lass ... ... ... ... | Jersey ... | 14 1 29 | 28187 | 4 1–32 | 273 | 24 | 6,582 | 5·06 | 330·43 | S. P. Herbert ... | Jessie's King of Sarnia |
| New Park Sally 9th ... ... | A.I.S. ... | 30–4–29 | 1873 | 20 2 32 | 273 | 22 | 8,751 | 3·68 | 319·48 | W. G. Burges ... | Ruler of Greyleigh |
| Moorlands Dazzle ... ... | Jersey ... | 14–9–27 | 31225 | 18–5–32 | 240 | 13½ | 5,565 | 5·35 | 297·66 | P. Rose ... ... | Moorlands Raleigh |
| Clarendon Eyre Romany Lass 2nd | do. ... | 23 5 29 | 33948 | 4–4–32 | 273 | 15½ | 5,911 | 5·00 | 296·64 | Sabina Vale Stud Farm | Eminent V.C. |
| Grassvale Golden Cream 3rd ... | do. ... | 28–8 29 | ... | 22 7–32 | 273 | 12 | 5.586 | 5·2 | 289·62 | R. H. Rose ... ... | Choice Goods of Garden Hill |
| Brookvale Toppers Mena ... | do. ... | 3 8–29 | 31176 | 17–6–32 | 273 | 12 | 5,286 | 5·4 | 285·42 | G. F. Combs ... | Bellefaire L. Belltopper |
| New Park Amy 7th ... ... | A.I.S. ... | 14–6–29 | 1865 | 15–2 32 | 273 | 20 | 7,065 | 4·00 | 280·11 | W. G. Burges ... | Ruler of Greyleigh |
| Moorlands Duchess ... ... | Jersey ... | 11-7-29 | 31289 | 4–6–32 | 210 | 15 | 5,610 | 5·00 | 277·35 | P. Rose ... ... | Moorlands Romeo |
| Moorlands Dream ... ... | do. ... | 1-9–29 | 31237 | 13–6–32 | 240 | 10 | 5,250 | 5·18 | 271·86 | P. Rose ... ... | Melrose Romeo |
| Greenmount Buttercup ... | do. ... | 26 5 29 | 28238 | 21 5–32 | 273 | 14½ | 5,053 | 5·22 | 261·31 | A. J. B. Strempel ... | Werribee Starbright King |
| New Park Mystery 4th ... | A.I.S. ... | 8–6–29 | 1870 | 12–2–32 | 273 | 26 | 7,023 | 3·73 | 260·38 | W. G. Burges ... | Ruler of Greyleigh |
| Grassvale Choice Maid ... ... | Jersey ... | 10-10–29 | 34812 | 5–9–32 | 273 | 18 | 4,674 | 5·4 | 253·69 | R. H. Rose ... ... | Choice Goods of Garden Hill |
| Denmark Red Rose 3rd ... | Guernsey... | 6–3–29 | 2521 | 28–12–31 | 273 | 15½ | 4,366 | 5·8 | 253·56 | Denmark Stud Farm | Rose Chief of Wollongbar |
| Moorlands Dingle ... ... | Jersey ... | 9–7–29 | 31231 | 7–7–32 | 210 | 14½ | 5.430 | 4·66 | 251·91 | P. Rose ... ... | Melrose Raleigh |
| Brookvale Topper's Lulu ... | do. ... | 15–7–29 | 31175 | 13–6 32 | 273 | 9½ | 4,438 | 5·6 | 249·91 | G. F. Combs ... | Bellefaire L. Belltopper |
| Snowdrop 27th of Kurrawang... | A.I.S. ... | 5–5 29 | 1380 | 27 11–31 | 273 | 21 | 6,063 | 4·1 | 246·21 | W. G. Burges ... | Standard of Cosy Camp |
| Muresk Petunia ... ... ... | Guernsey... | 29–11–29 | 2796 | 1 5–32 | 273 | 11 | 4,413 | 5·4 | 236·90 | Muresk Agricultural College | Triump of Wollongbar |
| Brookvale Topper's Success ... | Jersey ... | 10–8–29 | 31177 | 13–7–32 | 273 | 12 | 4,651 | 5·0 | 235·53 | G. F. Combs ... | Bellefaire L. Belltopper |

HERD TESTING—*continued.*

| Name of Cow. | Breed. | Date of Birth. | Herd Book No. | Date of Calving. | No. of Days in Test. | Weight of Milk Last day of Test. | Weight of Milk for period. | Average Test. | Butter Fat. | Owner. | Sire. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | lb. | lb. | % | lb. | | |
| **COWS (OVER 2½ YEARS AND UNDER 3 YEARS OLD)—STANDARD 250 LBS. BUTTER FAT—*continued.*** | | | | | | | | | | | |
| Colmyn Ladybird ... ... | Jersey ... | 24-9-29 | 31190 | 11-6-32 | 273 | 9 | 4,517 | 5·21 | 234·59 | C. H. Ironmonger ... | Rye Duke of Glen Iris |
| Moorlands Dulcie ... ... | do. ... | 17-5-29 | 31241 | 12-2-32 | 210 | 22 | 3,915 | 5·67 | 226·17 | P. Rose ... ... | Moorlands Raleigh |
| Wyuna Goldie ... ... ... | Guernsey... | 12-10-29 | 2670 | 3-5-32 | 273 | 11 | 4,293 | 4·99 | 213·37 | Muresk Agricultural College | Nundorah Buccaneer |
| Colmyns Marinora Rye ... | Jersey ... | 13-9-29 | 31191 | 7-4-32 | 273 | 9 | 3,627 | 5·56 | 200·42 | C. H. Ironmonger ... | Rye Duke of Glen Iris |
| Capel Centenary Girl ... | do. ... | 15-10-29 | 34781 | 9-8-32 | 240 | 7 | 4,330 | ... | 200·26 | B. W. Prowse ... | Bracken Fern of Roeland |
| Muresk Dahlia ... ... ... | Guernsey... | 6-6-29 | 2526 | 9-5-32 | 273 | 10 | 3,405 | 5·50 | 187·67 | Muresk Agricultural College | Triumph of Wollongbar |
| Wooroloo Milkmaid ... ... | A.I.S. ... | 3-2-29 | 2520 | 20-10-31 | 273 | 6 | 3,813 | 4·65 | 176·84 | Wooroloo Sanatorium Farm | Triumph of Pine Creek |
| Claremont Lupin 6th ... ... | do. ... | 19-12-29 | 2408 | 13-8-32 | 60 | 26 | 1,635 | ... | 64·14 | Claremont Hospital for Insane | Claremont Evan |
| Karridale Zonia ... ... ... | Guernsey... | 28-10-29 | 2842 | 20-9-32 | 30 | 19 | 570 | ... | 26·70 | E. D. P. Hayes ... | Minnamurra Betty's Prince |
| **COWS (UNDER 2½ YEARS OLD)—STANDARD 230 LBS. BUTTER FAT.** | | | | | | | | | | | |
| Koojan Tiddlewinks ... ... | do. ... | 24-9-30 | 3546 | 7-9-32 | 273 | 21 | 6,363 | 5·70 | 360·39 | A. W. Padbury ... | Homestead Ace |
| Greenmount Starlight Marinora | Jersey ... | 31-5-30 | 34841 | 7-4-32 | 273 | 18 | 5,994 | 5·90 | 353·07 | A. J. B. Strempel ... | Werribee Starbright Butter King |
| Nooka Twylish Madiera ... | do. ... | 16-7-30 | 34744 | 7-8-32 | 273 | 22 | 6,696 | 5·00 | 343·40 | S. P. Herbert ... | Spring Park Prince Ragtime |
| Claremont Mabel 3rd ... ... | A.I.S. ... | 1-11-29 | 2409 | 4-5-32 | 273 | 22 | 7,596 | 4·30 | 326·56 | Claremont Hospital for Insane | Sunnyvale Searchlight |
| Wooroloo Red Rose 2nd ... | do. ... | 25-6-29 | 2522 | 12-12-31 | 273 | 22 | 6,896 | 4·64 | 320·59 | Wooroloo Sanatorium Farm | Triumph of Pine Creek |
| Nooka Ragtime Rose ... ... | Jersey ... | 7-4-30 | 34743 | 26-3-32 | 273 | 16 | 4,788 | 6·26 | 310·08 | S. P. Herbert ... | Spring Park Prince Ragtime |
| Brookfields Lady Lilian ... | Guernsey... | 28-11-29 | 2720 | 11-5-32 | 273 | 19 | 5,997 | 5·05 | 303·15 | G. E. Scott ... ... | Koojan Lord Berkley |
| Cookalabbai Jewel ... ... | do. ... | 18-9-25 | 3771 | 19-12-31 | 273 | 23 | 6,069 | 5·20 | 301·58 | A. W. Padbury ... | Cookalabbai Pride 2nd |
| Moorlands Elsie ... ... ... | Jersey ... | 12-6-30 | 34803 | 17-7-32 | 210 | 11 | 5,430 | 5·18 | 279·84 | P. Rose ... ... | Melrose Romeo |
| Wooroloo Lass ... ... ... | A.I.S. ... | 30-12-29 | ... | 29-3-32 | 273 | 25 | 6,945 | 4·00 | 279·42 | Wooroloo Sanatorium Farm | Triumph of Pine Creek |
| Springhurst Belladonna... ... | Jersey ... | 12-2-30 | 33644 | 20-4-32 | 273 | 16½ | 5,544 | 5·03 | 276·55 | Sabina Vale Stud Farm | Starbright Prince of Glen Iris |
| Grangelea Pretty Primrose ... | do. ... | 31-10-29 | 33038 | 14-10-31 | 273 | 17 | 4,836 | 5·70 | 273·68 | Sabina Vale Stud Farm | Banyule Airo |
| Ilginup Agnes ... ... ... | A.I.S. ... | 2-12-29 | 5192 | 2-5-32 | 240 | 23 | 8,305 | 3·26 | 271·14 | E. C. Melville ... | Sally's Lad of New Park |
| Springhust Countess 5th ... | Jersey ... | 29-3-30 | 33647 | 27-4-32 | 273 | 14 | 4,992 | 5·41 | 270·72 | Sabina Vale Stud Farm | Valient Prince of Glen Iris |
| Melba 3rd of Tipperary ... | A.I.S. ... | 11-10-29 | 2358 | 16-11-31 | 273 | 23 | 6,279 | 4·25 | 267·04 | R. Bee ... ... | Melba's Re-Echo of Tipperary |
| Berrington Soprano 2nd ... | Jersey ... | 5-10-29 | ... | 19-12-31 | 273 | 12¼ | 4,312 | 6·20 | 266·61 | Sabina Vale Stud Farm | Banyule Superstrain |
| Ilginup Aimee ... ... ... | A.I.S. ... | 4-12-29 | 5193 | 4-4-32 | 273 | 12 | 6,341 | 4·19 | 265·34 | E. C. Melville ... | Greyleigh's Father Xmas. |
| Coolup Gladies 2nd ... ... | Jersey ... | 1-5-30 | ... | 7-7-32 | 273 | 10¼ | 5,386 | 4·70 | 263·39 | B. W. Prowse ... | Fairy's Duke of Grass Vale |
| Minathorpe Treasure 5th ... | A.I.S. ... | 20-10-29 | 2477 | 21-2-32 | 273 | 19 | 5,592 | 4·36 | 261·63 | R. Bee ... ... | Collier of Darbalara |
| Ilginup Adele ... ... ... | do. ... | 27-11-29 | 5191 | 13-3-32 | 273 | 9 | 5,235 | 5·10 | 260·75 | E. C. Melville ... | Victory of Aorangi |
| Moorlands Ella ... ... ... | Jersey ... | 5-3-30 | 34802 | 16-7-32 | 210 | 11 | 4,410 | 5·82 | 256·17 | P. Rose ... ... | Melrose Romeo |
| Wyuna Lady Dawn ... ... | Guernsey... | 12-11-29 | 2472 | 3-2-32 | 273 | 20½ | 5,596 | 4·53 | 253·68 | Denmark Stud Farm | Nundorah Prosper |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Grassvale Lady Fowler 11th ... | Jersey ... | 20-6-30 | 34817 | 8-8-32 | 273 | 14 | 4,542 | 5·60 | 253·19 | R. H. Rose ... ... | Choice Goods of Garden Hill |
| Springhurst Melilot 4th .. | do. ... | 2-4-30 | 33648 | 21-3-32 | 273 | 12½ | 4.037 | 6·22 | 249·12 | Sabina Vale Stud Farm | Valient Prince of Glen Iris |
| Iginup Annette ... ... | A.I.S. ... | 10-12-29 | 5194 | 12-4-32 | 273 | 15 | 6.118 | 4·08 | 245·30 | E. C. Melville ... | Victory of Aorangi |
| Grassvale Cream Goods ... | Jersey ... | 28-8-29 | 34814 | 7-12-31 | 273 | 17 | 5.136 | 4·90 | 245·13 | R. H. Rose ... ... | Choice Goods of Garden Hill |
| Minnamurra Prairie Bell ... | Guernsey... | 2-11-29 | 2619 | 17-1-32 | 273 | 19 | 4,917 | 4·84 | 241·61 | Muresk Agricultural College | Minnamurra Rose |
| Wynna Jean ... ... ... | do. ... | 8-9-29 | 2471 | 2-3-32 | 273 | 15½ | 5.146 | 4·80 | 241·29 | Muresk Agricultural College | Nundorah Buccaneer |
| Moorlands Elaine ... ... | Jersey ... | 13-4-30 | 34800 | 1-7-32 | 210 | 13 | 4.755 | 4·90 | 233·34 | P. Rose ... ... | Melrose Romeo |
| Priscilla of Tipperary ... ... | A.I.S. ... | 9-9-29 | 2359 | 17-11-31 | 273 | 17 | 5.061 | 4·60 | 230·49 | R. Bee ... ... | Villiers of Darbalara |
| Staghorn Northlark's Matilda ... | Jersey ... | 9-8-30 | 34787 | 19-6-32 | 273 | 11½ | 4.294 | 5·1 | 218·92 | Robinson Bros. ... | Staghorn Northlark's Masterpiece |
| Colmyns Cellene Rye ... ... | do. ... | 10-8-30 | 34751 | 16-8-32 | 273 | 10½ | 4.146 | 5·4 | 218·63 | C. H. Ironmonger ... | Fairy's Duke of Grassvale |
| Minnamurra Currency Lass ... | Guernsey... | 27-9-29 | 2606 | 27-3-32 | 273 | 13 | 4,779 | 4·55 | 217·63 | Muresk Agricultural College | Caramana Favour |
| Lonswood Ruth 5th ... ... | Jersey ... | 13-10-30 | 34785 | 18-3-32 | 273 | 6½ | 3,919 | 5·35 | 213·87 | B. W. Prowse ... | Hamel Cea Fancy's Dapper |
| Spurfield Eastern Jewel ... | Guernsey... | 1-12-29 | 2390 | 4-4-32 | 273 | 12 | 4.581 | 4·65 | 213·33 | Muresk Agricultural College | Spurfield Eastern King |
| Glenavon Trixie ... ... ... | A.I.S. ... | 21-3-30 | 5112 | 11-4-32 | 273 | 13 | 5,469 | 3·86 | 211·02 | D. Bevan ... ... | Pine Creek Dunbar |
| Staghorn Northern Belle ... | Jersey ... | 10-9-30 | 34786 | 22-8-32 | 273 | 11 | 3.588 | 5·80 | 209·88 | Robinson Bros. ... | Staghorn Northlark's Masterpiece |
| Woodendale Poppy ... ... | do. ... | 6-4-30 | 34717 | 23-5-32 | 273 | 9 | 4,572 | 4·50 | 207·82 | F. P. Attwell ... | Mokine Lady's Chief |
| Wollongbar Rosebud 2nd ... | Guernsey... | 10-1-30 | 2789 | 14-3-32 | 273 | 6 | 4,833 | 4·24 | 204·98 | Denmark Stud Farm | Wollongbar Satisfaction |
| Springhurst Sparaxis ... ... | Jersey ... | 19-3-30 | 33650 | 29-4-32 | 273 | 12 | 3,981 | 5·10 | 203·88 | Sabina Vale Stud Farm | Glen Iris Vigilant |
| Spurfield Desdemona ... ... | Guernsey... | 29-1-30 | 2764 | 25-2-31 | 273 | 15 | 4.050 | 5·07 | 203·17 | Denmark Stud Farm | Spurfield Eastern King |
| Minnamurra Sun Lady ... | do. ... | 25-2-30 | 2811 | 11-3-32 | 273 | 11 | 3,783 | 5·09 | 192·62 | Muresk Agricultural College | Minnamurra Justice |
| Minnamurra Eleanor ... ... | do. ... | 13-8-29 | 2607 | 14-10-31 | 273 | 16 | 4.203 | 4·44 | 186·56 | Muresk Agricultural College | Caramana Favour |
| Wollongbar Haughty ... ... | do. ... | 30-11-29 | 2492 | 27-2-32 | 273 | 13 | 3,399 | 5·00 | 170·13 | Denmark Stud Farm | Wollongbar Hopeful |
| Glanavon Fraulein ... ... | A.I.S. ... | 19-3-30 | 2363 | 10-4-32 | 273 | 10½ | 4,246 | 3·98 | 166·46 | D. Bevan ... ... | Pine Creek Dunbar |
| Colmyn Rodora ... ... ... | Jersey ... | 10-3-30 | 31192 | 18-3-32 | 273 | 5½ | 2,086 | 5·68 | 140·58 | C. H. Ironmonger ... | Rye Duke of Glen Iris |
| Woodendale Buttercup ... | do. ... | 24-9-30 | 34715 | 17-5-32 | 273 | 5½ | 2,911 | 4·70 | 136·93 | F. P. Atwell ... | Mokine Lady's Chief |
| Nooka Ragtime Lassie ... ... | do. ... | 13-10-30 | 34742 | 1-6-32 | 150 | 17½ | 2,550 | ... | 120·12 | S. P. Herbert ... | Spring Park Prince Ragtime |
| Woodendale Ettie ... ... | do. ... | 11-4-30 | ... | 20-6-32 | 90 | 12½ | 1.260 | ... | 63·09 | F. P. Atwell ... | Mokine Lady's Chief |
| Aberbechan Snowdrop ... ... | A.I.S. ... | 9-3-30 | 2449 | 5-4-32 | 60 | 26½ | 1,515 | ... | 62·16 | A. E. Grant ... ... | Raleigh Regent |
| Colmyn's Jessica... ... ... | Jersey ... | 6-12-29 | 31189 | 5-4-32 | 90 | 12½ | 1.185 | ... | 60·60 | C. H. Ironmonger ... | Rye Duke of Glen Iris |
| Glanavon Vida ... ... ... | A.I.S. ... | 29-6-30 | 5145 | 6-7-32 | 60 | 22 | 1,305 | ... | 57·39 | A. E. Grant ... ... | Raleigh Regent |

# BLOW-FLY DRESSINGS AND BRANDING FLUIDS.

## THE DETRIMENTAL EFFECT OF TAR CONTAINING PREPARATIONS ON THE WOOL.

H. McCALLUM, Sheep and Wool Inspector, and W. McC. JOHNSON, Cadet.

For many years a widespread campaign has been waged against the use of tar and similar materials, or of compounds containing them, as branding fluids or as dressings for blow-fly strike. In spite of this, however, their use has not been entirely discarded.

During the recent wool-selling season the management of one of the wool warehouses stated that portions of some of the station clips forwarded for sale were stained by some mixture which would not scour out. This was considered to be due to the fact that station owners had treated some of their sheep with the preparation in an endeavour to combat the blow-fly trouble. Two samples, one of the greasy wool and the other of scoured, drawn from one of these clips, were forwarded to this branch of the Department. The staining mixture in the greasy sample was analysed by the Government Analyst, who reported that the use of some creosote preparation, in all probability one containing wood creosote and arsenious oxide, was responsible for the staining of the wool. It was stated that creosote of both the wood tar and coal tar varieties contains large amounts of phenols, which darken by oxidation, on exposure to the light and air, and that the presence of tarry matter in the cruder creosote oils, which are often used in these preparations, would increase the staining and make it more difficult to remove. The stain was certainly very resistant to the ordinary methods of scouring, for although the second sample had been scoured twice under ordinary conditions, it was still of a colour ranging from dark to light brown.

In addition to the staining of the wool, pigments such as tar may seriously damage the fibre itself, as wool fibres are easily affected by strong chemical substances. Some merely render the wool harsh, whilst others seriously weaken it. Again, such substances, either by coating the fibre or removing or altering the surface scales, may prevent the wool properly taking dyes.

It is obvious, therefore, that the value of the wool if so contaminated will be very greatly reduced.

Whether it was a proprietary mixture or a station preparation used in the instance quoted is not yet known, but it was considered advisable to warn all wool-growers to be extremely cautious in their choice of branding fluids and of blow-fly dressings and, above all, to refrain from using tar or pitch for these purposes.

In giving this advice it is regrettable that no suitable formula for a sheep-marking fluid can be recommended as giving entirely satisfactory results for, under Western Australian conditions at least, no fluid officially tested has been beyond criticism from both the grower's and the manufacturer's points of view.

To meet requirements, a branding mixture must be permanent as a brand and yet easy to remove in the scouring process. The problem of evolving such a fluid has been engaging the attention of various research institutions throughout the wool-growing countries of the world, notably the Wool Industries Research Association of Leeds, England. This association recently contributed a note on the subject to the Journal of the British Ministry of Agriculture, which stated that it had recommended two branding fluids, one of which was suitable for use under

British and similar conditions, and the other for use in the Dominions; both of these fluids had been subjected to exposure trials. The Dominions fluid, of the following composition:—

| | Parts by weight. |
|---|---|
| Wool fat | 30 |
| Resin | 20 |
| Carnauba wax | 3 |
| Kieselguhr | 18 |
| Ignited iron oxide | 6 |
| Emco spirit | to consistency |

was tested in almost all the Dominions, and it was stated that the detailed reports indicated the success of the fluid from both the grower's and the manufacturer's standpoints.

In Australia, however, the mixture has been criticised on the ground of illegibility, but it is stated by a writer in the Journal of the Council for Scientific and Industrial Research that the criticism is not always warranted, for the Council carried out a very successful experiment with a number of shorn comeback wethers branded with a mixture made up according to the Association formula. After branding the sheep were continuously exposed to the weather and although at the time of writing ten months had elapsed, the brands were still plainly visible.

In Western Australia the fluid was tested in many different parts of the State, but the results were not nearly so convincing. The mixture, which had been prepared by the Association itself, was made up in three different colours, viz., red, blue and green, but, although in the case of the tests carried out at the Muresk Agricultural College the brand remained clear in outline from shearing to shearing, and on opening up the wool the colours themselves were plainly visible, in most cases the brands faded rapidly with the beginning of the winter while, owing to the accumulation of dust and grease in the tip, the colours were indecipherable after a period of about two months. Therefore, although this fluid is suitable to the manufacturer, for the Research Association states that the brand is always removed in a normal commercial scour and examinations of fabrics manufactured from wool so treated have revealed satisfactory results, it is not under all conditions suitable from the grower's point of view. We have, however, drawn attention to its composition because it is at least known that no detrimental effects can arise from its use.

In the case of blow-fly strike, the position is not nearly so unsatisfactory, for there are many dressings commonly recommended which are thoroughly efficacious, and yet neither stain the wool nor destroy any natural properties of the fibre. Recently the joint Blow-fly Committee appointed by the Council for Scientific and Industrial Research issued its first report* on the Sheep Blow-fly Problem. This report devotes a section to dressings, in the course of which it summarises the properties of a good dressing as follow:—

(a) It should kill or remove all maggots without injury to the sheep or the wool;

(b) it should be non-irritating to the skin or wounds;

(c) it should dry up the struck area and be soothing to the wound;

(d) it should act as a repellant to flies, and so prevent re-strikes for a reasonable period.

* This report may be obtained from the Department at the price of 1s. 6d. per copy. It contains all the latest available information concerning the many phases of this problem and is of great practical value to sheep-farmers.

In the light of these requirements, the report mentions the following dressings recommended by the Department of Agriculture, New South Wales:—

(a) 5 per cent. watery solution of zinc sulphate;

(b) 4 per cent. phenol crystals in whale oil;

(c) 5 per cent. watery solution of monsol.

The report states:—"All of these are of distinct value for the routine dressing of sheep under station conditions, and are adequate, except when re-strikes are frequent. Unfortunately, none has any marked repellent property, though the drying action of (a) and (c) is a valuable preventive. Some degree of repellent action may be obtained by the addition of 5 per cent. carbon tetrachloride to the phenol and whale oil dressing. Though the dressings recommended have the limitations mentioned, they constitute the most recent knowledge available, and this Committee concurs in these recommendations."

No criticisms of the value of proprietary dressings or branding fluids can be given here, as very few tests have been carried out by this Department. There are, of course, a number of these on the market and the farmer must, by test, decide their value for himself. In the case of branding fluids we might add that, although very many have been tested by various institutions connected with the woollen industry both in Australia and abroad, none have been reported as giving entirely satisfactory results. In fact, the Research Association fluid is the only one which, under some conditions at least, has proved suitable to both sections of the industry.

---

## HORTICULTURAL NOTES.

GEO. W. WICKENS, Superintendent of Horticulture.

When this Journal is printed the last of the deciduous fruit crop for season 1932-33 will have been gathered, the major portion sold, and orchardists busy preparing by careful husbandry for next season's production.

Though the season now nearly ended has not been one of the most favourable it has, nevertheless, proved far from being a failure either in quantites produced or prices received.

Export has been up to the average in quantity, over half a million cases being shipped before the end of May with more still to go. The actual number of cases to the 26th May (latest figures available at time of writing) amounted to 569,528, which comprises as the principal lines 477,512 apples, 46,976 pears, and 44,219 grapes. The quality of the greater portion of apples and pears submitted for export was above the average, apples particularly being solid in texture, of good colour, juicy and fine flavour. Grapes were a bit below the average in quality, the severe heat wave in February having made its influence felt to the disadvantage of many varieties. The variety worst affected was Muscat Gordo Blanco, one that is not looked upon as being a good export kind but which, in its season, is prime favourite on the local market as fresh fruit and provides in a dried condition the lexia of commerce. After the heat wave many bunches never properly ripened and losses were severe.

Currants cropped well and the quality was good. The yield of dried product will be in the vicinity of 1,600 tons, and of these a little over 1,000 tons have been shipped overseas. Sultana production has been over the average, about 400 tons being processed at the dried fruit sheds.

As mentioned above, growers' attention must now be turned to preparing for next season's crop—pruning, ploughing, spraying, cultivating (when not carried out in April)—all needing attention between now and early summer.

With reference to pruning I would like to say a word of warning to those who intend leaving apple trees, which are in their sixth to eighth years, unpruned with the object of hastening fruit bearing habits. The idea of leaving the leaders and horizontally placed laterals unpruned is quite a good one if the trees are strong and growing vigorously, but when this is done the dense growths in the centres of the trees must be thinned out or the desired cropping habit will not be attained owing to the buds in the heavily shaded portions of the trees failing to produce flowers.

Regarding spraying, it has been pleasing to find that fruit submitted for export this season has been very free from San Jose scale, and it is hoped that growers will continue the good work during this winter and spray thoroughly. As a matter of fact, it must be admitted by anyone who has first-hand knowledge in combatting the scale mentioned that it is not a difficult pest to control; two good sprayings in winter, one with oil and one with lime sulphur, and it is a difficult job to find live scale in the following summer, but if allowed to increase and multiply at its own sweet will the insects become so numerous that the trees may be devitalised and commence dying at the terminals.

In infested areas fruit fly has been more in evidence during the season just ended than for a number of years past, and all citrus and loquat growers should carefully watch for signs of infestation. In winter time baiting as a means of control cannot be relied upon, so trapping should be continuously carried out and all infested fruit boiled.

Orange aphis will make its appearance towards the end of winter, and where the insects are sufficiently numerous to damage young growths and blossoms spraying must be attended to. Tobacco extract and soap is an old and reliable spray, but very good results have been obtained in recent years by the use of white oils.

That Western Australia has added another to her list of successes in combating pests and diseases has been proved this season, no trace of apple scab, Venturia inequalis, having been discovered either in those orchards which were infested three seasons ago or in any other.

Codlin Moth also has not been seen for three seasons, a circumstance for which all apple growers must feel duly thankful.

---

## BEE COMBS AND FRAMES.

H. Willoughby Lance, Apiculturist.

Next in importance in the production of honey to the stocking of hives with pure bred bees of a good strain, is the provision of good combs and the careful and intelligent arrangement of them in the hive. Very often this is overlooked by beekeepers either owing to lack of knowledge or carelessness.

The invention of the movable frame and wax foundation and the centrifugal extractor during the last century entirely revolutionised beekeeping and enabled beekeepers to regulate the rearing of brood, reduce swarming, and produce larger crops of honey, and the scientist to study with exactitude the economy of the hive. The days are past when at the end of the season the beekeeper, to obtain the crop of honey, had to either destroy the bees or drum them into another skep or box,

cut out the comb, and separate as far as possible the brood comb from the combs of honey, which were crushed and often contained small quantities of eggs, brood, or pollen. The honey was then strained, but all the straining could not rid the honey of the flavour of the brood and pollen.

Present day methods are absolutely hygienic, as anyone can testify who has witnessed the removal of honey from the hives, and its extraction and preparation for the market.

Good combs can be used for many years for brood rearing or the storage of honey. To obtain these a good pattern of Root Hoffman self-spacing frames should be used, and the Victoria pattern with square sides is recommended.

There are four sizes of standard frames at present in use in Australia. These are similar to those generally used in America, where they have several other sizes. The dimensions of our frames, however, are different from those generally used in Britain. All four sizes are of the same length, that is 19 inches long, with projecting tags for suspension in the hive, the only difference being in the depth. The standard size is 9⅛ inches deep, and is generally used by all the large beekeepers for both the brood chamber and the supers or honey chambers. The three-quarter depth or W.S.P. frame, which is 7⅛ inches deep, has only come into use recently and is favoured by some beekeepers as it allows more gradual expansion of the hive for brood rearing or storage purposes.

The Bolton or Ideal frame is 5⅜ inches deep, and was originally introduced for the same purpose as the W.S.P. and for controlling swarming by Bolton's method of reversing the combs. The half depth is 4½ inches deep, and is intended for use as a super for honey storage when the flow is not heavy enough for the full depth frame. The advantage of using this frame for storage as against the Ideal or W.S.P. is that the standard extractor will take two frames in the place of one standard full depth; whereas it will only take one Ideal or W.S.P.

Another important recent use for the half depth or Ideal frame is to place a box of these full of honey on the hive as a food chamber for the winter and spring brood rearing. Colonies with food chambers are ensured against starvation and come out stronger and start brood rearing earlier than those with a scarce supply of honey.

All frames should be strongly wired and fitted with full sheets of foundation. The only exception is where swarms are hived. These may have starters instead of full sheets, as swarms are in a condition for comb building and invariably build worker comb in the first instance, but the practice is questionable even in this instance.

There are several methods of wiring. Three of the most general are illustrated herewith. Fig. 1 with four parallel wires is the simplest, and probably the most general, and is adapted for electrical embedding, whereas the other two have to be embedded with a warm spur wheel. Frames as purchased usually have four small holes drilled in the end bars ready for the wire. Two small tacks should be driven half home, one near the top hole and one near the bottom hole of one end bar at Nos. 1 and 8. Now take the reel of wire, which should not be of smaller gauge than No. 28 B.W.G. Thread the wire through the holes and twist the end round the tack; drive it home; stretch the wire until it twangs like a musical instrument; twist round the other tack and drive home. When fitting the foundation, the frame should be placed upside down and the foundation threaded between the wires, so that the wires are on alternate sides of the foundation, which must now be secured to the top bar. If an electrical embedder is used, contact is made

at each end of the wire for a few seconds until the wire is warm and sinks into the wax. If a spur wheel embedder is used, this is heated in a flame and run along the wire quickly and evenly and presses the wire into the warm wax.

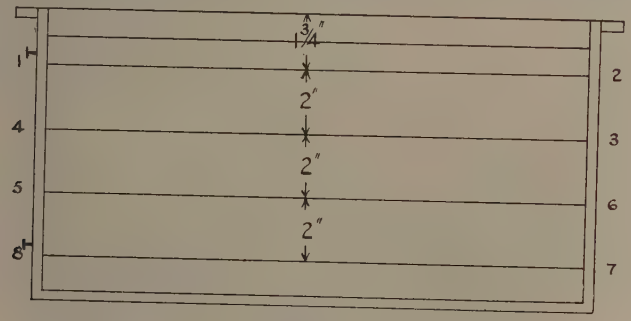



Fig. 1.

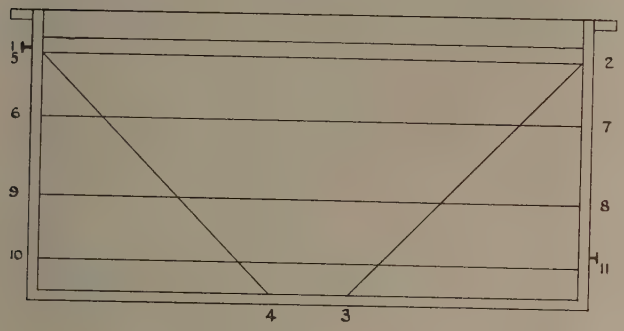



Fig. 2.

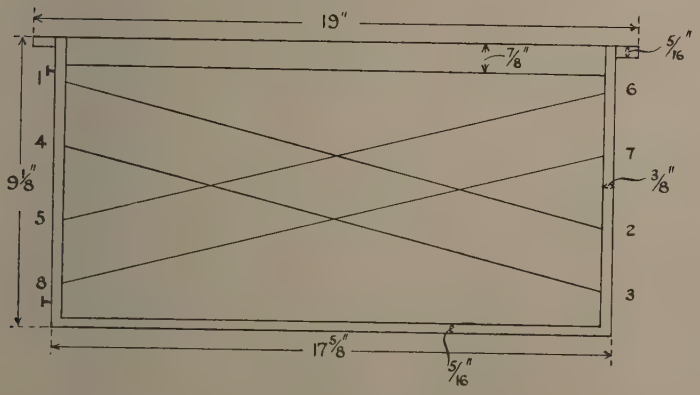



Fig. 3.

The wiring of figures 2 and 3 is similar, but the method of threading varies, as shown by the numbers. Some beekeepers use No. 26 galvanised iron wire for wiring No. 2, which makes a very strong comb not liable to break in the extractor.

The wiring of frames and fitting of foundation is one of the beekeeper's most tedious jobs, and is a comparatively slow process. Much thought and time have been spent by inventors to improve the strength of combs and the saving of time, such as aluminium foundation and other substitutes for wax, but none has been adopted to any extent. Two of the latest are three-ply foundation and wired foundation, both of which are being used to a large extent in America. The three-ply foundation is made of three very thin sheets of wax, the centre one being of vegetable wax for strength and the two outer ones of natural beeswax. This is used and fitted in the same way as ordinary foundation.

The wired foundation was first made by Dadant and Sons, U.S.A., and is now also made in a slightly different pattern by Pender Bros., N.S.W. I have tried the Dadant foundation, which is used in special frames with slotted bottom bars, and find that it does away with the tedious wiring and embedding and saves about 75 per cent. of time. The combs drawn out by the bees are as perfect as one could desire—working cells from top to bottom bar with only an occasional pop hole in the corners.

The Pendar wired foundation is similar, but has straight vertical wires instead of crimped, and the fixing to the bottom bar is slightly different, but the resultant combs should be as good as the Dadant, and I would strongly recommend beekeepers to give it a trial.

It should be borne in mind that there are four main reasons for preparing the frames as above:—

(1) These combs when completed, will be much stronger than those that the bees would build if left alone.

(2) They will be straight down from the top bar and not liable to be built across the frames.

(3) As all foundation is embossed with the bases of worker cells, the bees will build worker-cells thereon, except in a few cases where they will change to drone cells previous to swarming. If left to themselves, they usually build a large amount of drone cells, and rear an excessive number of drones instead of workers.

(4) Experiments have proved that to make 1 lb. of wax, bees consume from 12 to 16 lbs. of honey; therefore for every 1 lb. of wax foundation supplied, the bees will store an extra 12 to 16 lbs. of honey.

The next job is to get the frames of foundation drawn out into full combs. They may be given to either swarms or to colonies that are rapidly increasing in numbers, or when there is a prospect of a honey flow. If the swarm is small or the bees are only increasing slowly, it is best to give only two or three frames of foundation at a time, because if there is only a little honey coming in, the bees often tear down some of the foundation to use on other frames. Also in cool weather an excessive number of frames of foundation reduces the temperature of the hive.

Now as to the situation of frames in the hive. It must be remembered that the brood nest is usually in the centre and warmest place of the hive, and that the bees cluster thereon to hatch the brood. The outer circle of these centre combs contains pollen and honey, and the combs next to the brood nest also contain pollen and honey, being easily accessible to the young bees that have to feed on them to make the chyle or milk food for the larvae. Next come combs of honey, and lastly, if there is still room, combs in course of construction.

The natural place, therefore, for undrawn foundation is on the outside. However, in warm weather when there is plenty of honey coming in and breeding taking place, single combs may be placed next to the brood nest, as this hastens their drawing out, the bees being anxious to fill them with brood or food. A good time to get the combs drawn out is when the spring is well advanced and the brood chamber full of bees, brood, and honey. It should be the aim of all beekeepers to get two chambers full of brood and honey before trying to secure any surplus honey. To do this, take a body the same size as brood chamber to use as a second storey. Now take two or three frames of brood out of the bottom chamber and place in the centre of the second; close up the remaining brood combs and place frames of foundation on each side between them and the combs of honey, first damaging the cappings of any honey above the brood. The bees will then remove the honey and the queen will deposit eggs therein; otherwise there might be a bar of honey between the two chambers which the queen would not pass. If there is only a little honey in the brood combs placed in the second storey, it would be as well to transfer a comb of honey with them. Now fill up the second chamber with the frames of foundation, and close up. If the season is good, and the queen young and of a good strain, it is surprising how quickly she will fill the two chambers ready for the main honey flow, when a further one or two bodies may be placed on top. No excluder will be needed if the beekeeper manipulates the frames in the two lower chambers correctly, as the queen seldom climbs to the third storey unless overcrowded below.

In the manipulation of hives with old combs, the dark worker combs should always be placed in the centre where the brood nest is, and any drone combs on the outside next to the walls of the hive, as this is the last place the queen will lay in; unless, of course, drones are required for mating purposes, in which case one or two such combs should be placed in the centre. Drone combs may also be placed in the supers for the storage of honey.

Dark worker combs are also useful to place in the second storey next to the brood, or with a swarm that has been hived; one comb of brood and one dark worker comb for the queen to lay in will often prevent the swarm from absconding.

The cells of combs that have been used for the rearing of many generations gradually become smaller, as each chrysalis leaves a thin skin behind it. When these cells are noticeably small, the combs should be replaced, otherwise the young bees will not be able to develop to their natural size.

Badly damaged combs, or those with an excessive amount of drone cells, or those which have sagged and been patched up by the bees, so that there are a number of irregular cells that cannot be used for brood rearing, should never be placed in the brood nest, but should be taken away and melted down; otherwise there will be so much waste space where every inch is valuable, brood rearing of the workers will be restricted, and the tendency to swarn will be increased.

Stretched cells on the upper portion of the combs in the lower brood chamber have a tendency to act as a bar to the queen in passing from one chamber to the other, Should there be any of these, they should be placed in the second chamber. Careful sorting and arrangement of all combs is a great assistance to the beekeeper in the prevention of swarming and the storage of surplus honey.

# A CONVENIENT METHOD OF TOP-WORKING CITRUS TREES.

RAY C. OWEN, Dip. Agric.,
Orchard Supervisor.

In these days of reduced returns for primary products it behoves every orchardist to keep the cost of production at a minimum. This cannot be done unless the orchard is 100 per cent. efficient, that is unless every tree is producing regular crops of good quality fruit. All unhealthy trees should be given proper treatment, or if they are at a stage where it would not pay to treat them, they

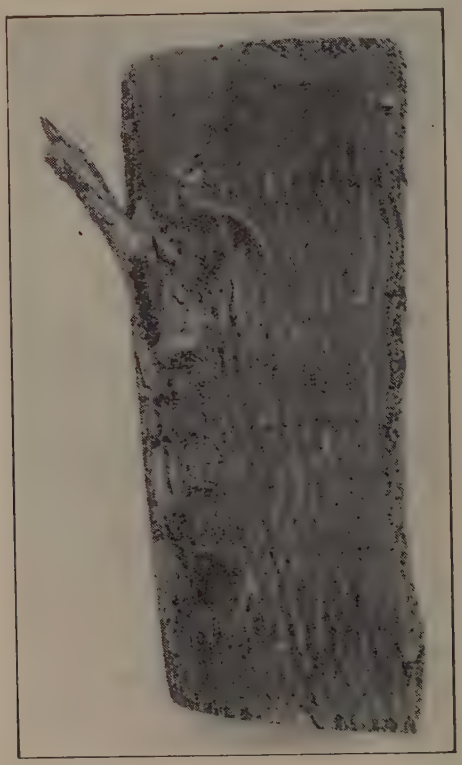


Fig. 1.—The side bark graft after the binding has been removed, showing how the scion has healed in.

should be grubbed out. Any healthy trees that are producing inferior quality fruit, or fruit for which there is no market, should be worked over to varieties which are profitable and suitable to the particular district.

In the issue of the *Journal* for June, 1932, several methods of top-working were described, and any orchardist who is handy with tools will find the work very interesting and quite easily performed. A convenient method of top-working citrus

is by using the side bark graft. This may be used alone, or in conjunction with the cleft graft. The chief advantage of the side graft is that the tree is not cut back until after the scions have healed in. Thus, if the grafts happen to fail the tree is in no way disturbed. The grafting is best done in the spring-time—September and October—but fair results may be obtained at any time while the sap is flowing provided that the weather is reasonably cool. The operation is very simple, and is

Fig. 2.—The side graft nine weeks after cutting back, showing vigorous growth of the scion.

performed by first making a "T" incision in the bark of the selected limb, slightly raising the edges of the bark, and then inserting the scion (2-3 buds) which has been prepared by making a long diagonal cut to form a chisel point. A piece of bark immediately above the "T" may be removed so that the scion will fit snugly in position. The graft is then tightly bound in position and waxed over.

When the scion has healed in it usually remains dormant until it is convenient to cut the tree back. The graft then starts into vigorous growth and soon forms a new tree of the desired variety.

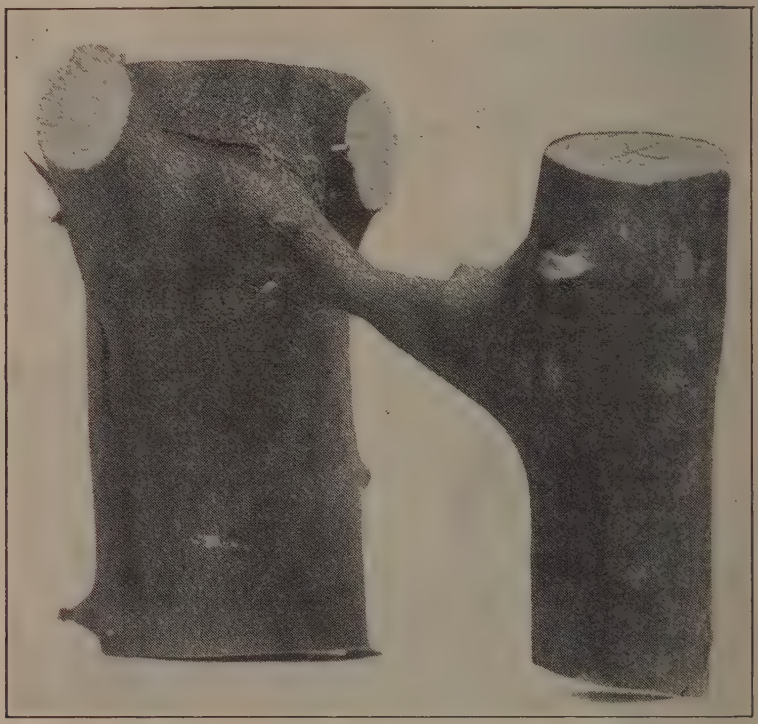


Fig. 3.—A natural graft or inlay. This occurred in Mr. Brown's orchard at Armadale, and was caused by a branch of one limb contacting in the fork of another limb and eventually becoming united.

## BARLEY GROWING.

Review by R. P. ROBERTS, Agricultural Adviser, of a Barley Survey by Henry Clark Grant (His Majesty's Stationery Office), 2s.

No 62 of the Empire Marketing Board's publications is a comprehensive study of barley production, exports, imports, marketing, markets and prices in the principal exporting and importing countries of the world, made by Professor H. C. Grant, of the Department of Agricultural Economics in the University of Manitoba.

The volume of international trade in barley has shown a decrease from 5 million tons in 1909-13 to about $3^3/_4$ million tons in 1926-30. This decrease is not due to an expansion in production in the chief importing countries, but to a definite decline in consumption.

The United Kingdom and Germany absorb two-thirds of the world's surplus, and Belgium, the Netherlands and Denmark a further 20 per cent. The main exporting countries are Canada, the United States, Roumania and Russia.

The study gives consideration to the characteristics and uses of barley, world production, and trade and prices. It deals in some detail with the chief importing and exporting countries, but particularly with the United Kingdom as an importer and Canada as an exporter. The problem of finding markets for the increasing surpluses of the chief producing areas is a pressing one. In England, for example, the supply of high-grade malting barley—two-row barleys—is normally in excess of demand.

Dealing with Australia's position as an exporter, the author remarks:—"Eighty-six per cent. of the total barley acreage in Australia is sown to malting barley, and their exports are practically all of this class. No doubt more barley could be produced and the quality of export shipments of malting barley be improved by better seed and better harvesting methods. It is doubtful, however, if the existing demand for malting barley of this kind in the United Kingdom would remunerate the Australian producer for the extra cost and effort involved in attempting to gain a greater share in a market already over-supplied." And again ".....any attempt to encourage the production of malting barley in Canada, Australia or California, with the hope of selling more malting barley or malt to the United Kingdom, is hardly worth the effort."

From the Western Australian standpoint there is an item of particular interest. For the manufacture in England of light, sparkling, filtered bottle beers it is essential that 25 per cent. to 40 per cent. of high-quality, sun-ripened, six-rowed barley must be used in the composition of the grist. This has not yet been produced within the Empire. Supplies are drawn almost solely from California from a region of light but fertile soil, heavy rains during the early growing season and virtually no rain nor cloudy weather during ripening and harvest. The most ideal conditions for quality production are reached in the Sacramento Valley, where the temperature may reach 100deg. at harvest and the crop receives less than 10in. of rain in the growing period.

This barley is held in high repute by English maltsters and has consistently provided appreciable quantities of the imports into the United Kingdom. It is known as Californian Bay Brewing Barley.

As Western Australia possesses a climate very similar to that of California, as there is now a 10 per cent. Empire preference on imported barley, and as the manufacture of beer is now permitted in the United States, and will probably absorb a certain percentage of the Californian crop, it would appear that further investigations might be made with profit as to the possibilities of growing the Californian type of malting barley in this State. Any export, of course, would have to be made in face of the strong Californian competition.

Professor Grant has included numerous tables, graphs, and diagrams to supplement his conclusions. There is also a comprehensive appendix dealing with production, acreages, exports, imports, etc., in the various countries of the world. The book is invaluable to anyone who wishes to obtain a correct picture of the present day position of the world trade in malting barley.

## ARTIFICIAL MANURE SUBSIDY.

1. The Commonwealth Relief Act of 1932 provides for the payment *to primary producers* throughout Australia of a subsidy of 15s. per complete ton of artificial manure used by such primary producers in the production of primary produce other than wheat during the year ending 30th November, 1933.

2. This means that, providing a primary producer has applied to the soil during the period 1st December, 1932, to 30th November, 1933, one ton of artificial manure in connection with the production of any primary product, *except wheat,* he will be eligible to claim 15s. subsidy. If he has used two tons during that period he will be eligible to receive 30s., and so on; but if he has used less than one ton no subsidy is payable, as the Act prescribes that, in calculating amounts of subsidy, fractions of a ton shall be excluded.

3. The financial assistance in regard to the use of artificial manure applies to primary producers in respect of every product except wheat. Special provision has, of course, been made for wheatgrowers under Commonwealth grants distributed by the States. Producers of oats, hay, barley, hops, beans, apples, pears, citrus fruits, tobacco, etc., will therefore be eligible to claim the subsidy, which will also apply to artificial manure used in top-dressing of pastures.

4. Artificial manure for purposes of the Act is any substance which contains nitrogen, phosphoric acid or potash, and hich has been manufactured, produced, or prepared in any manner for the purpose of fertilising the soil or supplying nutriment to plants, but does not include any animal or vegetable matter which has not been subjected to process of manufacture.

Lime does not come within the meaning of artificial manure for the purposes of the Act.

5. Applications for subsidy must be made in ink on a special form, which form also contains a declaration to be completed by the primary producer in the presence of either a Commissioner for Declarations, a J.P., Bank Manager, Postmaster, Station-master, or Constable or Officer of Police. No other official is authorised to take this declaration.

6. Upon completion of the claim and supporting declaration the producer is required to forward same to the Head Office of the firm from which his supplies of artificial manures were obtained. The supplying firm will then certify as to the quantity or quantities of manures actually supplied to the claimant, and will forward the form direct to the Fertiliser Subsidy Section. Certificates from local agents of the manufacturing or supplying firms will not be accepted.

7. It will be noted that primary producers are not eligible to submit applications for the subsidy until they have actually used the artificial manure in regard to which they desire to claim financial assistance. They should use the full quantity of artificial manure which they intend to apply in regard to any particular product before submitting an application. A claim should not be submitted in regard to a portion of the quantity used and then submit one or more claims for the remainder. The Department of Commerce hopes that in most cases it will be necessary for only one claim to be made by primary producers, but it is recognised that in special circumstances two claims may be necessary.

8. Producers are requested to exercise every care in completing their claims so as to ensure that they claim the subsidy only in respect of artificial manure *used* during the period 1st December, 1932, to 30th November, 1933. If the artificial manure was applied to the soil prior to 1st December, 1932, no subsidy is payable. It must also be used prior to 30th November, 1933, to be eligible for the subsidy.

All particulars asked for on the form of application must be filled in by the applicant, the area planted and quantity of manure used for each different class of produce being separately shown. Unless claims are properly signed and completed delay in payment of the subsidy will be occasioned as a result of the necessity for their return to producers for completion or correction.

9. Forms of application are now obtainable at all country post-offices throughout the State or direct from the Fertiliser Subsidy Section, G.P.O. Building, Perth.

## ROYAL AGRICULTURAL SOCIETY.

### SUMMER FODDER CROP COMPETITION.

(G. K. Baron-Hay, Superintendent of Dairying.)

The following results of the Summer Fodder Crop Competition conducted by the Royal Agricultural Society for the Season 1933 are now available.

Judging was carried out by Messrs. M. Cullity, H. G. Elliott, Agricultural Advisers, and C. Giles, Dairying Instructor, attached to the Department of Agriculture.

The season generally, owing to the dryness of the summer, resulted in poor growths of summer fodder crops, but the results from farms in the Competition show what can be obtained where careful attention is paid to cultivation of the soil.

Particulars of the points gained and the methods of cultivation adopted by the competitors are shown in the following tables:—

| Competitor. | Yield. 50 | Evenness of Growth. 10 | Freedom from Weeds. 15 | Cultivation. 15 | Freedom from Disease. 10 | Total Points. 100 |
|---|---|---|---|---|---|---|
| A. Rodway, Harvey ... | 49 | 8 | 15 | 14 | 7 | 93 |
| L. Pearson, Benger ... | 36 | 8 | 14 | 14 | 10 | 82 |
| H. Brown, Manjimup ... | 34 | 9 | 13 | 15 | 10 | 81 |
| H. F. Jay, Yanmah ... | 30 | 4 | 12 | 13 | 9 | 68 |
| M. Wells, Busselton ... | 21 | 5 | 15 | 15 | 10 | 66 |

The following are the particulars regarding the methods of cultivation, fertiliser, etc.:—

| —— | A. Rodway. | L. Pearson. | H. Brown. | H. F. Jay. | M. Wells. |
|---|---|---|---|---|---|
| Date weight taken ... | 7–3–33 | 24–1–33 | 10–5–33 | 25–3–33 | 17–2–33 |
| Drills apart ... ... ... | 33 inches | 32 inches | 36 inches | 24 inches | 24 inches |
| Average height ... ... | 5–7ft. | 6–10ft. | 8–9ft. | 0–14ft. | 6½ft. |
| Fertiliser—Rate per acre ... | 3 : 1 super and ammonia plus Potash 8 cwt. per acre | Bone, super and potash 3 cwts per acre. | 5 : 1 super and ammonia 300 lb. per acre | 5 : 1 : 1 super, ammonia, and potash 650 lb. per acre | Super, sulph. ammonia and No. 2 potato manure |
| Soil ... ... ... ... | Yellow - red clay loam | Yellow - red clay loam | Brown sandy loam | Sandy | Grey clay loam |
| Rate of Seeding ... ... | ... | 30lb. per acre | 25lb. per acre | 20lb. per acre | 17lb. per acre |
| Date of Seeding ... ... | 1st Nov. | At intervals | 15th Jan. | At intervals | At intervals |
| Estimated weight per acre. Tons. | 24·5 | 17·7 | 16·9 | 15·0 | 10·5 |

# *THE MILKING COW AND HER PASTURE.

Geo. L. Sutton, Director of Agriculture.

Probably never before in the history of Western Australia and certainly not since the beginning of the present century, has it been so necessary as it is at present for dairymen to produce cheap cream. The world over, good pasture is recognised as the foundation of cheap milk and cream. Because of this, it is appropriate to consider the characteristics of our clover belt pastures to ascertain their possibilities and to determine how they can be utilized to meet the needs of the milking cow for the economic production of cream.

Comparisons between different pastures and foods are usually based upon a study of their composition as disclosed by a chemical analysis. Typical analyses are shown in Table 1. From an examination of the result of such analyses, it will be seen that the constituents can be divided into two main divisions, viz.:—

1. Water, and
2. Dry matter, *i.e.*, matter containing no water and including the ash.

Dry matter contains all the nutrients, *i.e.*, the materials from which the energy is developed, wear and tear made good, and new tissues built up. The dry matter also supplies such bulkiness as is required to meet the capacity of the animal. The capacity of a dairy cow or the amount she is able to consume is from 20 to 30 lbs. of dry matter.

Table I.

TYPICAL STOCK FOODS.

| Stock Food. | Total in 100lbs. of Food. | | | | | |
|---|---|---|---|---|---|---|
| | Water. | Dry Matter. | | | | |
| | | Crude Protein. | Fat. | Nitrogen Free Extract. | Crude Fibre. | Ash. |
| | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. |
| Subterranean Clover (Hay Stage) | 75 | 4·5 | 0·75 | 12·5 | 5·0 | 2·25 |
| Fodder Maize ... ... | 78 | 1·9 | 0·6 | 13·0 | 5·3 | 1·2 |
| Lucerne ... ... ... | 75 | 4·75 | 1·0 | 11·25 | 5·0 | 3·0 |
| Bran ... ... ... | 12 | 16·0 | 2·0 | 58·0 | 8·0 | 4·0 |
| Oats ... ... ... | 12 | 9·0 | 5·0 | 58·5 | 11·5 | 4·0 |

Though water contains no nutrients, it is nevertheless very important, since it is the medium by which the nutrients are able to function. It is also an important constituent of the blood and of every tissue, especially of the muscles and vital organs. It constitutes quite one half of the weight of the body. It serves to carry away most of the waste products that arise from the activities of the body, particularly those secreted through the kidneys and retention of which in the body would rapidly constitute a serious menace to the health of the animal.

In consequence, neglect to provide the animal with adequate water supplies for its needs will restrict the production of that animal, just as quickly as the neglect to supply any other food ingredient. It is therefore obvious that the pas-

* Prepared by courtesy of the Australian Broadcasting Commission from notes of an address broadcasted from 6WF on 8th May, 1933.

ture for the dairy cow should be succulent and any shortage of moisture in the pasture must be supplied from other sources.

Few dairymen realise the quantity of water which is essential to meet the requirements of high producing cows. A milch cow requires about 4 lbs. of water for every pound of *dry* matter consumed and at least 2 lbs. for each pound of milk produced. Thus a three-gallon cow will require 70 to 80 lbs. of water for general purposes, and about 60 to 70 lbs. for milk production, or a total of 130 to 150 lbs. = 13 to 15 gallons daily.

As will be seen from the comparison of some well-known stock foods as shown in Table 1, the nutrients in the dry matter are divided into five groups, viz.:—

1. The ash or mineral matter.
2. Crude proteins.
3. Fats, oils, etc.
4. Carbohydrates.
5. Fibre or cellulose.

Until comparatively recently it was considered that the mineral content of a pasture or fodder was of such minor importance that it could be neglected provided the animal was furnished with sufficient nutrients from the other groups to meet its requirements.

Investigations have shown clearly that mineral deficiencies are far more commonly responsible for unsatisfactory results with stock than was previously suspected.

Only extremely minute amounts of most minerals are required and will be adequately supplied in the food. The most common mineral elements found in foods are:—Lime, phosphate, and the two constituents of common salt, viz., soda and chlorine. The two most likely to be deficient in Western Australia are phosphate and lime, but cows receiving reasonable supplies of leguminous fodder, as would be the case in the clover belt, are not likely to suffer from a deficiency of lime. Our pastures as they become mature do become deficient in phosphates and need supplementing in this respect. Suitable supplements are:—Dicalcic phosphate containing 37 per cent. of phosphoric acid sterilized bonemeal containing 22 per cent. phosphoric acid, and proprietary licks having either or both of these materials as their base. The minerals sodium and chlorine can be supplied by feeding common salt and, in consequence, it is quite a common practice to mix Dicalcic phosphate and bonemeal with stock salt to form a lick.

Incidentally it may be stated that a deficiency of phosphate in the pasture is one of the causes of sterility in dairy cows, and is believed to be the principal cause of botulism or "toxic paralysis" which has caused such enormous stock losses during the present autumn.

The feeding value of the other four groups of nutrients (crude protein, fats, carbohydrates, and fibre) cannot be reliably measured by an examination of the composition of the food as disclosed by an analysis. It is equally important to take into account the digestibility of the different constituents, for it will be readily realised that the quantity digested is of more importance than the amount eaten. Further, the digestion of food and other work performed by the internal organs of the body involves the expenditure of energy, the cost of which is borne by the food.

The value of a fodder depends, therefore, upon three factors:—

1. Its composition,
2. Its digestibility, and
3. The cost of digesting it.

The nutrients, crude protein, fats, carbohydrates, and fibre have one feature in common, viz., each is capable of producing in the animal's body compounds—like fats and sugars—which the animal can later transform into energy. Hence the respective capacities of each of these nutrient groups for this purpose is known as its "energy value," the sum of all being the energy value of the food.

Just as a merchant finds it necessary to convert different national currencies to a common denomination—a British merchant to pounds sterling—an American merchant to dollars—so it has been found convenient to express the energy value of foods as one denomination. The denomination chosen has been that of starch, which is a rich and easily digested carbohydrate. The energy value of a food is therefore commonly expressed in terms of its *starch equivalent.*

The constituents of the protein group are the only ones which contain nitrogen, and as this element is a constituent of muscle and certain other animal products, it follows that the proteins are essential for the building of these new products and to repair the wear and tear of the animal body. In consequence, when considering the value of a food, it is necessary to take into account the proportion of protein in the food as well as the total nutritive value of it, and, as previously pointed out, also its mineral content.

Having realised that the value of a pasture or fodder depends upon—

1. The protein content;
2. The *starch equivalent* or energy value of its nutrients including that of the protein; and
3. Its mineral content;

it is now opportune to discuss the relative value of our clover belt pastures, using the best available details relating to subterranean clover as being typical of them.

It will be convenient to give consideration at first to the energy value and to deal with the phosphatic aspect as representing the deficient mineral content separately and later.

With extreme differences at the beginning and end of the season, it is obvious that there is a considerable variation in the quality of the pasture throughout its length. For the purposes of comparison, pastures of three definite types are taken. These are—

1. Young pasture 3in. to 5in. high;
2. Hay stage pasture, *i.e.,* when the seed is forming, but not maturing;
3. Mature pasture when matured and dry in the field.

The available figures show the composition of Subterranean pasture to be as follows:—

SUBTERRANEAN CLOVER.

| | 100 lbs. contain. | | |
|---|---|---|---|
| | Water. | Digestible Crude Protein. | Production Starch Equivalent. |
| | % | % | % |
| Young Pasture ... ... ... ... | 82 | 3·4 | 12 |
| Hay stage pasture ... ... ... ... | 75 | 2·7 | 11 |
| Mature pasture ... ... ... ... | 10 | 4·0 | 27 |

These figures show that the mature pasture contains slightly more protein and twice as much starch equivalent as the young pasture, thus indicating that it is that much more valuable as a fodder, and so it is *pound* for *pound*. This, however, does not present a correct picture of the relative values, for, as has been pointed out, it is the nutritive value of the *dry matter* that has to be considered. When this is done, we find 100 lbs. dry matter contains—

| | Digestible Crude Protein. | Production Starch Equivalent. | Phosphoric Acid. |
|---|---|---|---|
| | % | % | oz. |
| Young pasture ... ... ... ... | 19 | 68 | 22·4 |
| Hay stage pasture ... ... ... ... | 10·8 | 44 | 9·6 |
| Mature stage pasture ... ... ... | 4·5 | 30 | 6·4 |

Now what a change in values! The young clover stands out tremendously in the forefront. It contains nearly twice as much dry digestible protein as at the hay stage, whilst its starch equivalent is over 1½ times greater. Its advantage over the matured clover is even greater. It contains over four times as much protein and its starch equivalent is over twice as great. Astonishing as it may seem to some, the young clover pasture with its starch equivalent of 68 and protein content of 19 is a richer food than bran with a starch equivalent of 54 and protein content of 15.

Now let us see how the various types of clover meet the requirements of the milking cow. To do this it will be necessary to use what are known as feeding standards for milking cows, and for this purpose it is proposed to use those based upon the classical work of the German investigator Kellner. These are given in Table II.

Table II.

STANDARD REQUIREMENTS.

Milch Cow—750lbs. weight.

Dry matter—20–30lbs.

| For. | Standard Requirements. | | |
|---|---|---|---|
| | Digestible Crude Protein. | Productive Starch Equivalent. | Phosphoric Acid. |
| | lbs. | lbs. | ozs. |
| Maintenance ... ... ... ... | 0·5 | 4·5 | 0·8 |
| One Gallon Milk ... ... ... | 0·6 | 2·5 | 0·3 |
| Total 1 Gallon Milk ... ... | 1·1 | 7·0 | 1·1 |
| „ 2 „ „ ... ... | 1·7 | 9·5 | 1·5 |
| „ 3 „ „ ... ... | 2·3 | 12·0 | 1·8 |
| „ 4 „ „ ... ... | 2·9 | 14·5 | 2·1 |
| „ 5 „ „ ... ... | 3·5 | 17·0 | 2·4 |
| „ 6 „ „ ... ... | 4·1 | 19·5 | 2·8 |
| „ 7 „ „ ... ... | 4·7 | 22·0 | 3·1 |

From the above table it will be seen that a cow weighing, say, 750 lbs., requires:

| | Digestible Crude Protein. | Production Starch Equivalent. |
|---|---|---|
| | lbs. | lbs. |
| For maintenance ... ... ... ... ... | ·5 | 4·5 |
| For each gallon, of 4 per cent. milk ... ... | ·6 | 2·5 |

and so on with proportional additions for each gallon of milk produced.

It is important to emphasise that the maintenance is the same whether the cow is producing 1 gallon or 5. These feeding standards are intended as a guide to supplement the experience of the feeder and not take its place and in this connection they serve an excellent purpose.

Assuming an abundance of young pasture available, a cow eating 140lbs., supplying 25 lbs. of dry matter, would obtain 4.7 lbs. protein and 17.0 starch equivalent, or sufficient starch equivalent and more protein than is necessary for a cow producing 5 gallons of milk.

In view of the excess of protein it is pertinent to consider whether the addition of some supplement to the pasture would not provide a more balanced ration. In Table III. the digestible nutrients of the best known supplements will be found.

TABLE III.

PASTURE SUPPLEMENTS.

| Stock Food. | Total in 100lbs., Dry Matter. | | |
|---|---|---|---|
| | Digestible Crude Protein. | Productive Starch Equivalent. | Phosphoric Acid. |
| | lbs. | lbs. | lbs. |
| Bran (wheaten) ... ... ... | 14·6 | 54 | 2·12 |
| Wheat ... ... ... ... | 10·2 | 83 | 0·79 |
| Barley ... ... ... ... | 9·3 | 85 | 0·93 |
| Oats ... ... ... ... ... | 8·0 | 71 | 1·05 |
| Linseed Meal ... ... ... ... | 29·0 | 80 | 1·90 |
| Clover Hay ... ... ... ... | 10·8 | 44 | 0·6 |
| Oaten Hay ... ... ... ... | 4·8 | 41 | 0·2 |
| Poor meadow Hay ... ... ... | ... | 12 | ... |
| Lucerne—in flower ... ... ... | 14·0 | 42 | 0·76 |
| Fodder Maize ... ... ... ... | 5·0 | 57 | 0·50 |
| Silage—mixed pasture ... ... | 8·4 | 40 | 0·56 |

In this connection it should be pointed out that the composition of a stock food is not constant, but varies as the result of many factors, and the figures given in that table have been selected from those available as being representative of the

food to which they refer. With this information available it has been possible to draw up a number of rations with young subterranean clover as a base and compare them with a ration of pasture only. These rations will be found in Table IV.

Table IV.

SUBTERRANEAN CLOVER—YOUNG STAGE.

| Ration. | Weight. | Composition. | | | |
|---|---|---|---|---|---|
| | | Dry Matter. | Digestible Crude Protein. | Productive Starch Equivalent. | Phosphoric Acid. |
| | lbs. | lbs. | lbs. | lbs. | ozs. |
| 1. Pasture ... ... | 140 | 25 | 4·8 | 17 | 5·6 |
| 2. Pasture ... ... | 110 | 20 | 3·8 | 13·6 | 4·5 |
| Wheat or Barley ... | 6 | 5 | 0·5 | 4·2 | 0·6 |
| | | 25 | 4·3 | 17·8 | 5·1 |
| 3. Pasture ... ... | 110 | 20 | 3·8 | 13·6 | 4·5 |
| Oats ... ... | 6 | 5 | 0·4 | 3·6 | 0·8 |
| | | 25 | 4·2 | 17·2 | 5·3 |
| 4. Pasture ... ... | 83 | 15 | 2·9 | 10·2 | 3·4 |
| Clover Hay ... | 11 | 10 | 1·1 | 4·4 | 1·0 |
| | | 25 | 4·0 | 14·6 | 4·4 |
| 5. Pasture ... ... | 110 | 20 | 3·8 | 13·6 | 4·5 |
| Bran ... ... | 6 | 5 | 0·7 | 2·7 | 1·7 |
| | | 25 | 4·5 | 16·3 | 6·2 |
| 6. Pasture ... ... | 83 | 15 | 2·9 | 10·2 | 3·4 |
| Oaten Hay ... | 11 | 10 | 0·5 | 4·1 | 0·3 |
| | | 25 | 3·4 | 14·3 | 3·7 |
| | | Phosphatic | Lick needed. | | |
| 7. Pasture ... ... | 83 | 15 | 2·9 | 10·2 | 3·4 |
| Poor Meadow Hay ... | 11 | 10 | ... | 1·2 | ... |
| | | 25 Phosphatic | 2·9 Lick needed. | 11·4 | 3·4 |

From this table it will be seen that it is not possible to balance the excess of protein with the supplements available, but that wheat, barley or oats could be used to supplement a scarcity of pasture without reducing the productivity of suitable cows. For lower producing cows oaten and clover hay are useful supplements, with even poor meadow hay for low producers or cows advanced in lactation period. Here it may be stated that young pasture will enable the most to be made of the inferior hay, but of course such fodder cannot be used profitably with high producing animals.

So many farmers are accustomed to regard bran as highly as to consider that it must be an improvement in any ration. This, however, is not so, and evidence in this connection is furnished by a comparison of ration 5, with pasture only, and

rations 2 and 3. A comparison of these latter two shows that, with young pasture, bran is inferior to wheat, barley and oats.

Neither is bran indispensable, as many dairymen think. Admittedly it is a very valuable and convenient fodder for dairy cows, but, like other fodders, it is valuable because it supplies energy-producing material. Sometimes the nutrients supplied by bran can be supplied more cheaply by other foods. This is illustrated in Table V. in which 200 lbs. of a mixture of linseed and meal replaces 300 lbs. of bran. This mixture supplied the same amount of protein and almost the same production starch equivalent as the bran, and, in 1931, effected a saving of nearly £2 per ton of bran, though at the present quotations the advantage is slightly in favour of the bran.

TABLE V.

SUBSTITUTE FOR BRAN.

| Fodder. | Weight. | Composition. | | Cost. | |
|---|---|---|---|---|---|
| | | Protein. | Productive Starch Equivalent. | 1931. | 1933. |
| | lbs. | lbs. | lbs. | s. d. | s. d. |
| Bran ... ... ... | 330 | 35·0 | 148·5 | 28 1 | 18 6 |
| Oats ... ... ... | 100 | 8·0 | 59·5 | 8 6 | 5 0 |
| Linseed Cake ... ... | 100 | 27·8 | 74·5 | 13 6 | 14 6 |
| Mixture ... ... ... | 200 | 35·8 | 134·0 | 22 0 | 19 6 |
| Loss or saving on 330lbs. Bran ... ... ... ... ... | | | | + 6 1 | — 1 0 |
| Loss or saving on 1 ton Bran ... ... ... ... ... | | | | + 36 10 | — 6 0 |

+ equals Saving, — equals Loss.

With pasture at the hay stage, a cow consuming 30 lbs. of dry matter contained in 120 lbs. of pasture would obtain 3.2 lbs. digestible crude protein and 13.2 lbs. starch equivalent. This is sufficient starch equivalent for a 3-gallon cow with an excess of protein. It would be difficult to increase production on this pasture without the addition of a purchased concentrate like wheat, barley, or oats, or a mixture of one of these with linseed meal. The most suitable home grown supplement for this purpose would be green lucerne, but even this would not make a very material difference as its starch equivalent is only 45 compared with that of 40 for the pasture. Bran would be slightly better, as it has a starch equivalent of about 54. A mixture of linseed meal and ground wheat would be much better, and with such a mixture supplying one-third of the dry matter, the nutrients supplied would be sufficient to increase the production from 3 to between 4 and 5 gallons. But with butter fat ranging around 10d. per lb., it is very doubtful whether any purchased concentrate could be used with profit. Such a condition emphasises the need for the dairy farmer in Western Australia to regard himself as the producer of pastures and fodder crops for which his milking cows are the market.

The rations compounded with hay stage pasture and the supplements referred to will be found in Table VI.

TABLE VI.

SUBTERRANEAN CLOVER.

HAY STAGE.

| Ration. | Weight. | Composition. | | | |
|---|---|---|---|---|---|
| | | Dry Matter. | Digestible Crude Protein. | Productive Starch Equivalent. | Phosphoric Acid. |
| | lbs. | lbs. | lbs. | lbs. | ozs. |
| 1. Pasture ... ... | 120 | 30 | 3·2 | 13·2 | 2·9 |
| | | Phosphatic | Lick needed. | | |
| 2. Pasture ... ... | 100 | 25 | 2·7 | 11·0 | 2·4 |
| Wheat or Barley ... | 6 | 5 | 0·5 | 4·2 | 0·6 |
| | | 30 | 3·2 | 15·2 | 3·0 |
| | | Phosphatic Lick needed. | | | |
| 3. Pasture ... ... | 100 | 25 | 2·7 | 11·0 | 2·4 |
| Oats ... ... ... | 6 | 5 | 0·4 | 3·6 | 0·8 |
| | | 30 | 3·1 | 14·6 | 3·2 |
| | | Phosphatic | Lick needed | | |
| 4. Pasture ... ... | 80 | 20 | 2·2 | 8·8 | 1·9 |
| Linseed Meal ... | 6 | 5 | 1·5 | 4·0 | 1·5 |
| Wheat or Barley ... | 6 | 5 | ·5 | 4·2 | ·6 |
| | | 30 | 4·2 | 17·0 | 4·0 |
| 5. Pasture ... ... | 80 | 20 | 2·2 | 8·8 | 1·9 |
| Lucerne ... ... | 40 | 10 | 1·4 | 4·2 | 1·2 |
| | | 30 | 3·6 | 13·0 | 3·1 |
| | | Phosphatic | Lick needed | | |
| 6. Pasture ... ... | 100 | 25 | 2·7 | 11·0 | 2·4 |
| Bran ... ... ... | 6 | 5 | ·7 | 2·7 | 1·7 |
| | | 30 | 3·4 | 13·7 | 4·1 |

And now consideration of the dry mature pasture. 33 lbs. of this will supply 30lbs. of dry matter from which the cow could obtain 1.35lbs. digestible protein and starch equivalent 9.0lbs., about sufficient for a cow producing 1½ gallons. Even for moderate producers, some home grown supplement, as a mixture of lucerne and fodder maize, is definitely indicated.

By dividing the dry matter requirements about equally amongst the three fodders, pasture, lucerne, and green maize, the production of suitable cows can be raised to the three-gallon class. Supplementary mixtures of clover and oaten hay, though not as good, will so improve the quantity of nutriments supplied as to

render a production of two gallons probable. Possible rations with mature pasture and supplements will be found in Table VII.

TABLE VII.

SUBTERRANEAN CLOVER.

MATURE STAGE.

| Ration. | Weight. | Composition. | | | |
|---|---|---|---|---|---|
| | | Dry Matter. | Digestible Crude Protein. | Productive Starch Equivalent. | Phosphoric Acid. |
| | lbs. | lbs. | lbs. | lbs. | ozs. |
| 1. Pasture ... ... | 33 | 30 | 1·4 | 9·0 | 1·9 |
| | | Phosphatic | Lick needed | badly. | |
| 2. Pasture ... ... | 11 | 10 | 0·5 | 3·0 | 0·6 |
| Lucerne ... ... | 40 | 10 | 1·4 | 4·2 | 1·2 |
| Fodder Maize ... | 45 | 10 | 0·5 | 5·7 | 0·8 |
| | | 30 | 2·4 | 12·9 | 2·6 |
| | | Phosphatic | Lick needed | badly. | |
| 3. Pasture ... ... | 22 | 20 | 1·0 | 6·0 | 1·2 |
| Clover Hay ... | 11 | 10 | 1·1 | 4·4 | 1·0 |
| | | 30 | 2·1 | 10·4 | 2·2 |
| | | Phosphatic | Lick needed | badly. | |
| 4. Pasture ... ... | 22 | 20 | 1·0 | 6·0 | 1·2 |
| Oaten Hay ... | 11 | 10 | 0·5 | 4·1 | 0·3 |
| | | 30 | 1·5 | 10·1 | 1·5 |
| | | Phosphatic | Lick needed | badly. | |
| 5. Pasture ... ... | 28 | 25 | 1·1 | 7·5 | 1·6 |
| Bran ... ... | 6 | 5 | 0·7 | 2·7 | 1·7 |
| | | 30 | 1·8 | 10·2 | 3·3 |
| 6. Pasture ... ... | 11 | 10 | 0·5 | 3·0 | 0·6 |
| Linseed Meal ... | 12 | 10 | 3·0 | 8·0 | 3·0 |
| Wheat or Barley ... | 12 | 10 | 1·0 | 8·4 | 1·2 |
| | | 30 | 4·5 | 19·4 | 4·8 |
| | | Phosphatic | Lick needed. | | |

The relative natural productivity of the three types of pasture would appear to be:—

| | | |
|---|---|---|
| Young .. .. .. .. .. | 5 | gallons |
| Hay .. .. .. .. .. | 3 | gallons |
| Mature .. .. .. .. .. | 1½ | gallons |

And now, how do these types of pasture supply the necessary phosphate?

The young pasture is richest in this respect, containing 3½ times as much as the mature pasture and 2 1/3rd times as much as pasture in the hay stage.

A daily ration of young pasture providing 25 lbs. of dry matter will contain over 5ozs. phosphoric acid. It is estimated that one-half to one-third of the phos-

phoric acid in this pasture would be assimilated; assuming the larger proportion to be available. there would be sufficient to meet the requirements of a 5-gallon cow and for which the other nutriments are also available.

Thirty pounds of dry matter in the pasture at the hay stage contains nearly 3ozs. of phosphoric acid. Assuming that one-half of this is available, then the pasture would supply only sufficient phosphoric acid to meet the requirements of a two-gallon cow. As this pasture is capable of supplying the other nutrients required by three-gallon cows, the need for a phosphatic lick is apparent.

At the mature stage, 30 lbs. of dry matter will supply barely 2ozs. of phosphoric acid. With an assimilation at the rate of the previous estimation, this is only sufficient for a one-gallon cow. For higher producers a phosphatic lick is definitely and badly needed.

It will thus be seen that, except when in very young pasture, milking cows should be supplied with a phosphatic lick, and also even when on young pasture, if for any reason they have not been adequately supplied with a phosphatic supplement during the preceding summer.

Between each of the pasture stages referred to, there is a gradual transition from one stage to the other, and, as has been shown, a gradual lowering of the nutritive value. Similarly from the third stage of mature pasture there is a further and gradual decline in food value until the zero stage is reached. Even on the best regulated non-irrigated dairy farms, it may be impossible to prevent the zero pasture stage being reached, particularly after a dry summer and when the autumn rains are belated. When the dairy farmer trusts solely to the pasture for the support of his stock, the results are disastrous and cause untold suffering to the animals, some of which, because of their better constitutions, may survive by existing upon the gradual decomposition of their tissues. The modern dairyman will take steps to prevent this by the conservation of hay and silage and the growth of such summer fodder crops as are possible.

Suggested rations for the period when no pasture is available are given in Table VIII.

Table VIII.

NO PASTURE AVAILABLE.

| Ration. | Weight. | Composition. | | | |
|---|---|---|---|---|---|
| | | Dry Matter. | Digestible Crude Protein. | Productive Starch Equivalent. | Phosphoric Acid. |
| | lbs. | lbs. | lbs. | lbs. | ozs. |
| 1. Silage ... ... | 40 | 10 | 0·84 | 4·0 | 0·9 |
| Clover Hay ... | 12 | 10 | 1·10 | 4·4 | 1·0 |
| Oaten Hay ... | 11½ | 10 | 0·48 | 4·1 | 0·32 |
| | | 30 | 2·42 (3) | 12·5 (3) | 2·22 |
| | | Phosphatic | Lick needed. | | |
| 2. Lucerne ... ... | 40 | 10 | 1·4 | 4·2 | 1·22 |
| Clover Hay ... | 12 | 10 | 1·1 | 4·4 | 1·00 |
| Green Maize ... | 50 | 10 | 0·5 | 5·4 | 0·80 |
| | | 30 | 3·0 (4) | 14·0 (4) | 3·02 |
| | | Phosphatic | Lick needed. | | |

*Finally*, the outstanding lessons of our clover pasture, as I read them, are:—

1. Young pasture is so suitable for high production that the management should provide for the maximum number of newly-calved cows to come into profit when it is possible to make the greatest use of it.

2. The young pasture stage should be extended as long as is possible by grazing management, so as to keep it short and to delay its maturity.

3. The carrying capacity of the farm should be governed by the quantity of young pasture available rather than by the greater quantity of lower quality hay stage pasture. Such a policy would provide a surplus of hay stage pasture which could be conserved as silage and hay to supplement mature and zero pastures.

4. Additional supplements should be provided as far as facilities permit by growing winter hay crops and summer fodder crops like lucerne, fodder maize, Sudan grass, etc.

---

## FROST INJURY OF WHEAT.

H. A. PITTMAN, B.Sc.Agr., Plant Pathologist.

Very many specimens of wheat plants seriously injured by frost, not only on the heads but also on the stems and leaves, have been received for diagnosis by the Plant Pathology Branch of the Department of Agriculture during recent years, and particularly since 1930 onwards.

### *Symptoms of Wheat Plants injured by Frost.*

As very few of the farmers who have submitted wheat plants affected by frost seem to have had any definite idea of the real cause of the trouble, a description of symptoms which may be brought about by frost may prove of interest.

Frost can affect wheat plants in many different ways as described below:—

(a) *Head Injuries.*

Sometimes all that happens is that the male and female portions of a flower (botanically known as the *stamens* and the *pistil* respectively) are killed by the extreme cold, so that the necessary act of fertilisation which results in seed formation cannot take place. This means that one, several, or all, of the spikelets of the head remain partially or wholly free from grain although they may otherwise develop quite normally. In such a case the crop may appear, on casual observation, to be quite normal until close to harvest time, when it will be found that there is not nearly as much grain present as one had imagined from the general appearance of the crop, many apparently healthy heads being more or less empty.

When the frost is more severe, the wheat head may be considerably malformed. This malformation manifests itself in very marked "shrivelling" or dwarfing and wrinkling of all of the spikelets, or as "shrivelling" of some spikelets only at the top, middle or base of the wheat head. The spikelets immediately adjoining the injured ones in these last three cases may be quite normal in all external respects, sometimes bearing normal grain, and with the change from "shrivelled" to healthy spikelets coming with surprising suddenness. (See Fig. 1.)

Sometimes the heads are completely bleached and empty without the spikelets having the "shrivelled" appearance.

Fig. 1.—Various forms of frost injury of Wheat Heads.

Head on left completely bleached and empty. Next two heads show malformation of all their spikelets. The following pair are malformed at the tops only. The next one is malformed only in the middle region. Its neighbour is malformed at the top as well as in the middle. The last two (on the right) are malformed only at the base.

*Photo. by Government Printer.*

(b) *Leaf Injuries.*

There does not appear to be anything very characteristic about the symptoms of wheat leaves affected by frost, the injuries closely simulating in appearance the dying back of the leaves from the tips so often brought about in this State by hot drying winds or dry soil conditions or both combined. The leaf blades are frequently killed back and browned from the tips for about one-half of their length, although rare instances have been seen in which the injury had taken place right down the leaf sheath to its parent node.

Wheat plants seem to be most susceptible to frost injury at, or about, flowering time, *although many plants have been seen severely injured, both on the leaves and stems, long before the plants came out into ear.*

(c) *Stem Injuries.*

Frost injury of wheat stems may be indicated by a more or less conspicuous white ring encircling the stem a variable distance below the wheat head, but above the point where the true stem emerges from the topmost leaf sheath. Each ring may be about an inch in length or less and two such have occasionally been observed on the one stem separated by normal green tissue. (See Fig. 2.)

A more usual type of stem injury is a blistering or "silvering" of the skin (or epidermis) at, or in the neighbourhood of, the joints (or nodes) at various places along the stem. This silvering effect, which is due to the formation of very

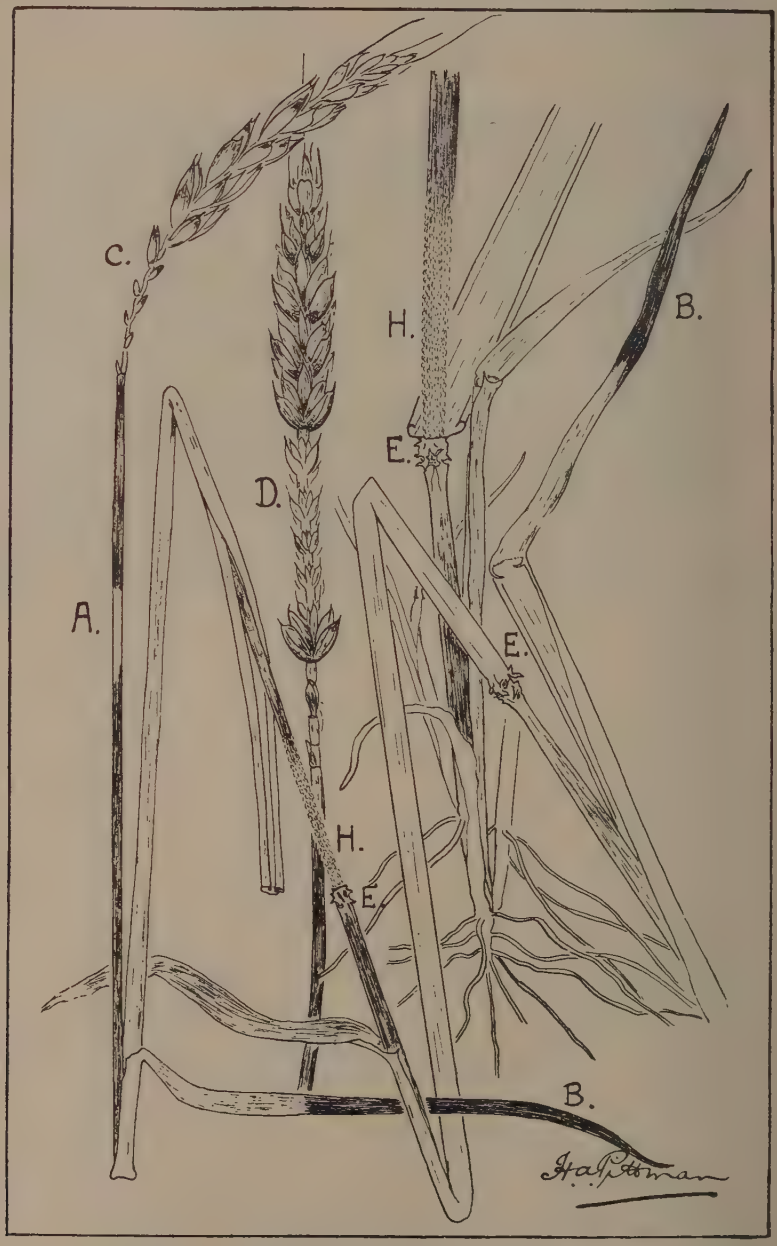



Fig. 2.—Various forms of frost injury on Wheat.

A. White ring on stalk between wheat head and topmost node. B. End of leaf killed back by frost. C. Unusual bareness at base of wheat head, due to frost injury. D. Malformation of wheat head, due to frost injury. E. Blistering, cracking, and rupturing of the epidermal tissues (skin) of the node or joint. H. Blistering and silvering of the epidermal tissues of the stem for a considerable distance above the node.

A, D, E, and H are reliable diagnostic characters of frost injury.

numerous minute puckerings or blisters in the epidermal tissues so that small air spaces are formed below them, is most frequently met with on the stem on the upper side of a node and only rarely on the lower side. It often extends up the stem above the node for a couple of inches or even more in rare cases. Associated with the formation of these minute blisters above the node region are often quite extensive cracks, ruptures, and blisters in the epidermis (skin) of the node itself. The "silvering" of the internodal tissues and cracking of the nodes as just described are not, in the vast majority of cases, to be observed except by pulling away the surrounding leaf sheath, which is usually quite uninjured. They are both positive indicators of frost injury and should always be looked for where such injury is suspected. The absence of these symptoms does not, however, indicate that frost injury has not occurred to other parts of the plant.

Cases are frequently found where the stem tissues for a couple of inches above a node and sometimes also below a node, have been transformed from the normal green colour into a brown silage-like colour. This symptom, which may occasionally be shown by the surrounding leaf sheath, is often due to frost. In such cases if the stem is split open, a dark reddish-chocolate-brown colour will sometimes be found lining the cavity of the stem in the region corresponding to the external injury. On the other hand cases have been seen where this brown discolouration was found inside the cavity of the stem without any discolouration being present outside. The "silvering," node cracking and silage-like lesions are frequently found at or near the topmost node of the stem, but any node may be the location of the injury and several injured areas are frequently found at different places on the one stem. Sometimes a longitudinal crack occurs down an affected internode. (An internode is the portion of the stem between two joints or nodes.)

Nodes blistered, cracked or ruptured as described above, often take on a dark colour wholly or in part, presumably owing to parasitic infection of the already injured tissues.

Sometimes the nodes are shrunken as if dried out and the epidermal tissues on either side of a node may have a tightly drawn and bleached appearance. A shiny brown discolouration apparently due to frost injury is often found on the stem extending downwards below the first node above ground level. This discolouration can usually be distinguished from similar stainings due to such a parasitic disease as "Foot-rot," for example, by the fact that the extreme bases of the stems and the root symptoms of the frosted plants are usually quite white and free from any indication of parasitic infection.

Frost-affected stems frequently fall over (lodge) near the first node above ground level. Many may break completely away from the plant. Should they not break off, they may eventually bend up into a vertical position again at an uninjured node and develop fairly satisfactory heads, provided the male and female structures have not been injured by the same or succeeding frosts. "Second growth" (late tillering) is often very well developed on wheat plants severely injured by frost on the original main stems.

### *Factors affecting Frost Injury of Wheat Crops.*

A study of correspondence and inquiries at this office concerning frost injury to wheat crops from the beginning of 1930 onwards, as well as reports of extensive field observations made by Agricultural Adviser G. L. Throssell, especially in the North-East and adjacent wheat areas, suggests that frost injury is most serious in wheat crops planted on an insufficiently consolidated soil. Crops grown on soils which are naturally light or of a fluffy nature such as morrell and kopi (Esperance wheat area) are apparently most subject to serious injury. Many farmers

have reported that their crops of the same variety planted at the same time on adjoining salmon gum and gimlet soils have either not been affected at all, or have not been affected to anything like the same extent on these heavy soils as on the neighbouring lighter land.

Fig. 3.—Wheat Heads showing the effects of hot drying winds at, or about, the flowering period.

The head on the extreme left is normal, that on the extreme right completely whitened and empty; all the others are "tipped," *i.e.*, whitened and free of grain for a greater or less portion of the terminal part of the head. Wind injury never occurs at the middle or base of a wheat head without also similarly affecting all the more terminal portions of the head, whether frost often does. This feature is often of considerable diagnostic value in distinguishing wind injury from frost injury. See Bulletin 301.

*Photo. by Author.*

Severe losses have occurred at times, however, on heavy soil where the seed-bed has not been sufficiently consolidated (by appropriate cultural practices, etc.) before seeding time. This seems to be particularly the case in newly cleared land where the crop has been "scratched in" on the burn or even where planted after one year of fallow following clearing. Other things being equal, the susceptibility to frost injury appears to decrease with subsequent cropping. (For similar evidence *re* the association of wind injury to wheat heads at or about flowering time and lack of consolidation of the seed-bed, see Bulletin 301.)

From information available frost injury appears to be more severe in the neighbourhood of growing timber than farther away. It is usually more serious in low-lying places than on the higher land in the vicinity. Slopes facing East seem to be more severely affected than those facing in other directions.

There is some indication that frost injury may be more serious on salty soils than on those not so affected. It has been observed by Agricultural Adviser G. L. Throssell that in some districts where frost injury has been exceptionally severe the plants have shown the bluish tinge often indicative of a salt problem.

Another factor which appears to be of importance is the time of planting. Crops planted earlier than has so far been found most suitable for that variety in the particular district concerned, seem to have been more seriously injured than those planted within the "correct" period.

*Economic Importance of Frost Injury to Wheat Crops.*

It is impossible to form any accurate estimate of the losses due to the ravages of frost in Western Australian wheat crops owing to the absence of any sufficiently extensive careful field surveys. From field observations, however, Agricultural Adviser G. L. Throssell considers that frost has so far caused greater economic loss to the farmers of the North-Eastern and Esperance wheat areas than any other wheat disease.

Almost all the centres from which frosted wheat plants have been received are located in the early zone of the Wheat Belt, and the areas most frequently submitting such specimens are those comparatively close to its most inland limits, such as the Northern portion of the Esperance wheat area, the Yilgarn, and the North-Eastern wheat area.

*Varietal Susceptibility to Frost Injury.*

Variation being, so it is said, "the most invariable thing in nature," it is to be expected that varieties will vary in their susceptibility to frost injury just as they do in morphological characters (appearance) and physiology (rate of maturation, chemical composition of the grain, and other "functional" activities). However, there is no reliable evidence at hand as yet as to any variation in this respect.

*Control.*

From what has been said above, the following control methods suggest themselves:—

1. Thorough consolidation of the seed-bed by seeding time so that there is a firmly compacted seed-bed on to which the seed can be placed about 1¼ to 1½ inches below the surface mulch.

2. "Seasonable sowing," that is the planting of each variety, when possible, in the period which has been found by experiment to be the most suitable for that variety in the district concerned. Moreover, the seed should be planted as near to the end of the permissible seeding period as possible. This also assists in the control of "Take-all" and "Flag Smut." (See Leaflets 119 and 160.)

3. The feeding off or cutting back of crops becoming too forward and rank owing to either (a) having been planted too early, or (b) the advent of unusually mild weather conditions during the early part of the growing season, or (c),—(a) and (b) combined. This is important also for the prevention of the "septoria," "dry blight," or "glume blotch" disease caused by *Septoria nodorum* which is essentially a disease of crops coming into ear too early in the season.

4. The planting of those varieties in very frost liable districts, which experience eventually shows to be the least susceptible.

# CONTROL OF "BLACK SPOT" OR "SCAB" OF PEARS IN WESTERN AUSTRALIA.

By JOAN HEARMAN, B.Sc.

The "Black Spot" disease of pears due to the fungus *Venturia pirina* (Aderhold) is the cause of serious economic loss in W.A. The following paper records the first attempt to study the disease in any detail in this State.

The author is indebted to Mr. H. A. Pittman, B.Sc. (Agr.), Plant Pathologist of the Department of Agriculture of W.A. and Lecturer in Plant Pathology at the University of W.A., and to Mr. W. M. Carne, Senior Plant Pathologist of the Council for Scientific and Industrial Research, for suggestions as to what particular problem of outstanding economic importance might be investigated in order to gain some experience of research work in plant pathology. Messrs. W. Sounness and Sons, "Merryup," Mt. Barker, were approached, and they readily agreed to allow their orchard to be used for the experiments. To them my thanks are due for their unfailing interest and co-operation without which the experiments on the control of the disease could never have been successfully carried out. The experiments were conducted under the general supervision of Mr. Pittman, whose help and advice throughout the carrying out of the work and its preparation for publication has been of inestimable value. Thanks are also due to Mr. H. A. Turner, of the Department of Agriculture, Tasmania, and to Dr. W. J. Dowson, late Plant Pathologist of the same department, for information conveyed in correspondence concerning their work on this disease in Tasmania. The work was carried out as part of the requirements for an Honours degree in Botany in the University of W.A. Thanks are due to Professor G. E. Nicholls and Mr. E. W. Bennet for the loan of apparatus and for kindly criticism of the text.

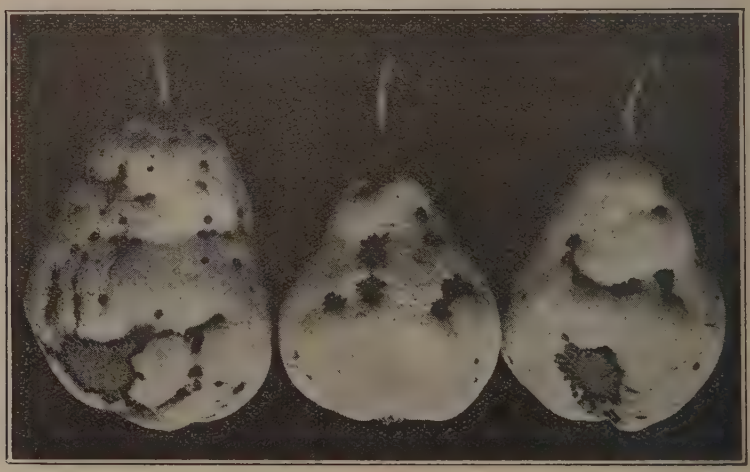


Fig. 1.

Williams Bon Chrietien or Bartlett pears badly affected with "Pear Scab" or "Black Spot" due to *Venturia pirina*.

*After H. A. J. Pittman, This Journal, June,* 1930.

The author is greatly indebted to the Department of Agriculture of W.A. which has rendered every possible assistance, and especially to the Director of Agriculture (Mr. G. L. Sutton) for the publication of this paper.

## INTRODUCTORY ACCOUNT OF THE LIFE HISTORY OF THE FUNGUS.

The economic losses due to "Black Spot" of pears are the result of the growth within the infected tissues of the causal fungus, and the eventual production of the summer spores (or seeds), known as *Fusicladium pirinum*, in dark velvety masses on the fruit, leaves, and young twigs. These spores spread the disease during the summer. They are produced from a *mycelium* (the thread-like body of the fungus), which lives just below the surface of the leaves, twigs, and fruit. When the infected leaves fall in the autumn this *mycelium* penetrates the deeper tissues of the leaf and produces fruit bodies, known as *perithecia*, which mature by the following spring, when they produce a different type of spore called *ascospores*, which infect the developing leaves and fruits with the disease.

## AIMS OF THE EXPERIMENTS.

The experiments were designed to determine—

(i.) Whether the disease could be controlled even in an orchard where it was causing very severe loss of the fruit annually.
(ii.) The primary source of infection in the spring.
(iii.) The effect of ploughing under the over-wintered leaves before the buds burst in the spring.
(iv.) How long the over-wintered leaves continue to be a source of infection when buried during the spring.
(v.) When over-wintered leaves first discharge *ascospores*.
(vi.) What weather conditions control the discharge of *ascospores*.
(vii.) For how long the discharge of *ascospores* may continue.
(viii.) The value of early ploughing alone as a control.
(ix.) The value of spraying alone as a control.
(x.) The value of early ploughing along with an extensive spray programme as a control of the disease.
(xi.) The relative value of Bordeaux Mixture and Lime Sulphur as sprays for the control of the disease.
(xii.) Whether each of these sprays would be equally effective on the two pear varieties Beurre Bosc and Glou Morceaux.
(xiii.) To what extent the disease would spread from diseased to healthy trees.
(xiv.) The value of autumn spraying in controlling the disease.

## THE EXPERIMENTAL PLOTS.

The orchard proved to be ideal for the experiments, as the trees were very severely infected. Beurre Bosc and Glou Morceaux, both varieties which are very susceptible to the disease, were available for the experiments. In May, 1932, 96 per cent. of the leaves on the Beurre Bosc trees, and 100 per cent. of the Glou Morceaux leaves showed "Black Spot" lesions. This estimate was made by picking hundreds of leaves off the trees at random and then examining them for "Black Spot" lesions on the blade and petiole. Wood lesions were plentiful, especially on the young wood. No conclusive evidence could be found that the two year old wood had living lesions, and no *Fusicladium* spores were obtained from wood of this age. Of the young wood on the Beurre Bosc trees 69 per cent., and of the Glou Morceaux wood 62 per cent., showed lesions in May, 1932. This estimate was made by counting the total number of young twigs on any branch, and then

counting the number of those twigs showing lesions. The 1931-32 crop had been a heavy one, but only a small percentage of it had been marketed owing to the ravages of the disease. These estimates show that the disease was acute on these two varieties.

*In these experiments* 310 *trees were used.* They were divided into two blocks.

*Block I.—38 trees—land unploughed—35 trees unsprayed.*

*Block* 1 consisted of 38 Glou Morceaux trees, and was not ploughed till December 7th, 1932. It was left unsprayed, except for three trees at the south-west corner which were sprayed with Bordeaux Mixture once in the early "pre-pink" stage. These three trees will be referred to as plot D.

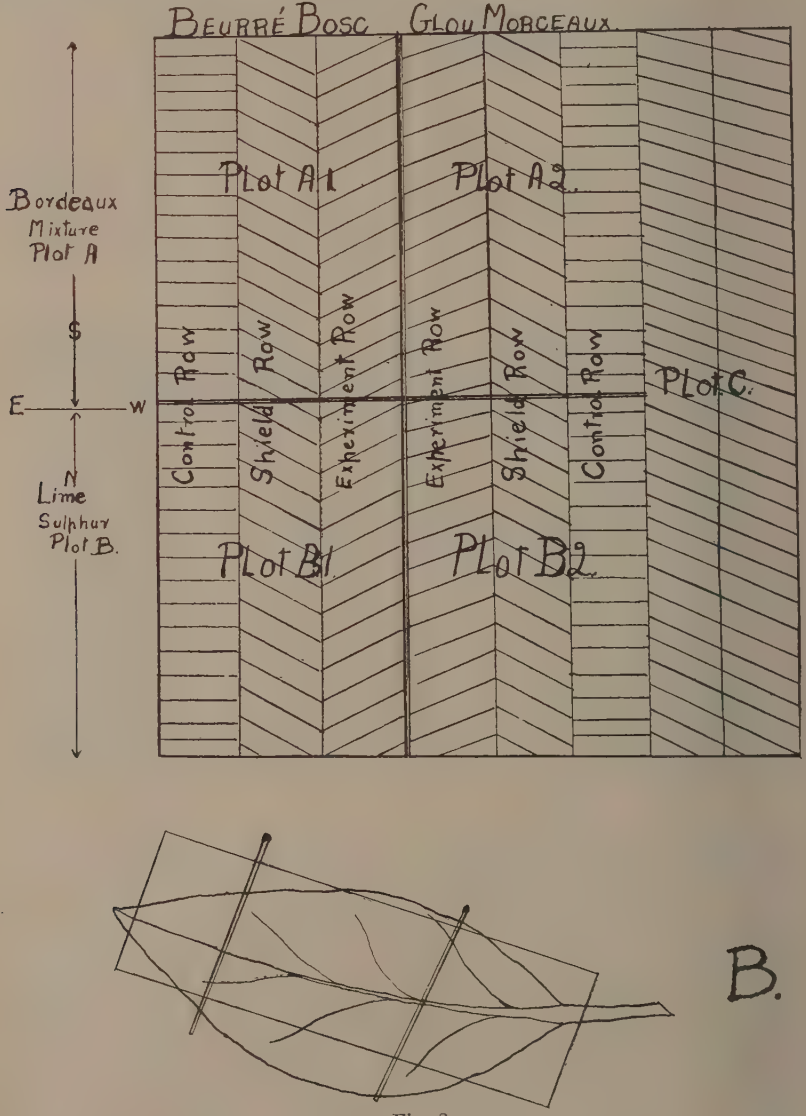



Fig. 2.

A. Plan of Block 2, Experimental Plots at "Merryup," Mt. Barker, W.A.
B. A microscope slide over a pear leaf as used to trap discharged *ascospores.*

*Block II.*—272 *trees—land ploughed*—204 *trees sprayed*—68 *trees unsprayed.*

*Block II.* (Fig. 2) was ploughed early,* and consisted of eight rows of 34 trees to a row, the rows running north and south. The three rows on the east side of the block were Beurre Bosc, while the five on the west were Glou Morceaux. The two westernmost rows of Glou Morceaux will be known as plot C. Of the six remaining rows the four centre rows received the full treatment, while the two outside rows were left unsprayed as controls. Of the four inner rows the southern half was treated with Bordeaux Mixture, and is known as plot A, while the northern half was treated with Lime Sulphur, and is known as plot B. Of these six rows the two innermost are known as experiment rows, the next two, working outwards, as shield rows, and the two outside rows as control rows. Plot C received the same spray treatment as plot A, but in addition it received an extra application of Bordeaux, 3-4-50, on December 13th, 1932.

## AUTUMN SPRAYING.

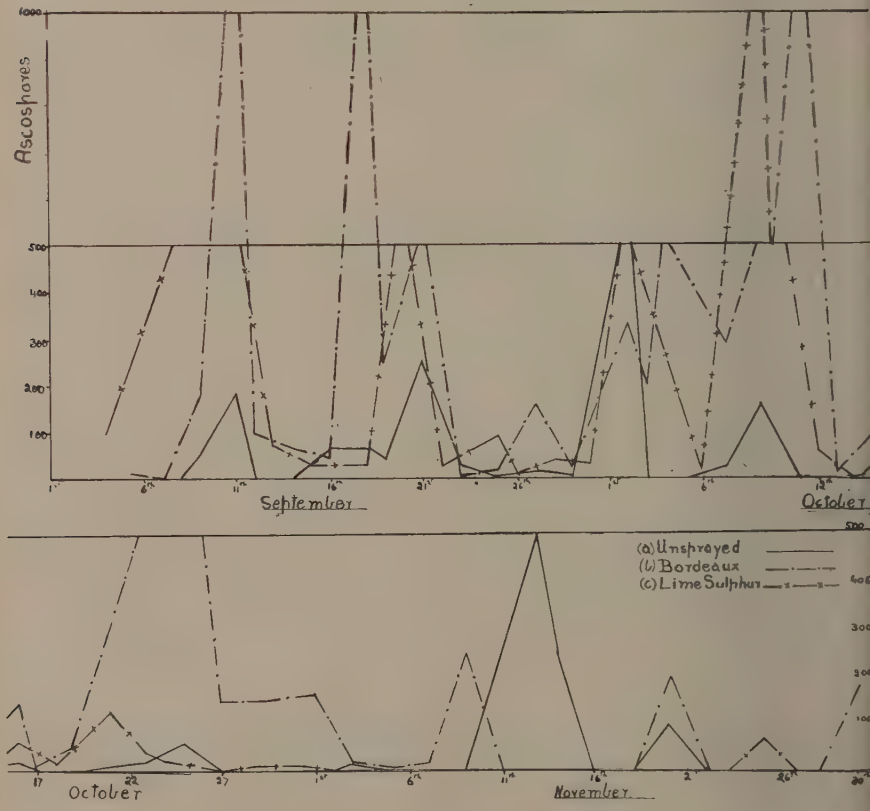
An autumn spraying of plot A I. and plot A II. (Fig. 2) shield and experiment rows with Bordeaux Mixture 6-4-50 was given on 23rd April 1932. The shield and experiment rows of plot B I. and B II. were sprayed with Lime Sulphur 1 to 15 on 25th April, 1932. It was subsequently found that leaves sprayed with either Bordeaux or Lime Sulphur in the autumn gave off more *ascospores* in the spring than those which were not sprayed. This was a somewhat unexpected observation, and this conclusion was drawn from the following experiment. In the autumn (30th April) six series of leaves (unsprayed, sprayed with Bordeaux, and sprayed with Lime Sulphur, from each of the two varieties) were collected, all with visible lesions. They were left in the orchard throughout the winter, under approximately natural conditions, being placed on soil in boxes and covered with wire netting to keep them in place. On 25th August three leaves from each box were placed on the ground in the orchard, and each leaf was covered with a slip of glass (a 3in. x 1in. microscope slide) supported by matches (Fig. 2B). The glass was smeared on the under surface with glycerine to collect the discharged spores. During September, October, and November a fresh slide was substituted every forty-eight hours, and a count was made of the number of spores adhering to the slide, except in cases where there were too many to count. In these cases spores were counted to five hundred, and are recorded as five hundred plus. In this manner a record of the total number of *ascospores* discharged from each of these eighteen leaves during this period was obtained. It is assumed that the number of spores adhering to the slide bore a constant relation to the total discharge. The observations commenced on 26th August and *the initial discharge took place on 4th September.* From this date some spores were observed on the slides each day, so the *discharge of ascospores was continuous for three months.*

Graphs I. and II. indicate that more spores were discharged from the leaves which were sprayed in the autumn than from those which were not sprayed, suggesting that the autumn spraying was actually harmful in this case. It must be remembered, however, that the leaves were heavily infected when the spray was applied, and that a spray is only a preventive measure. If the leaves had been free of disease, or fairly so, after the fruit was picked, immediate spraying might have prevented the fresh outbreak of the disease, which occurred with the onset of the autumn rains. This result is only that of one experiment on "Black Spot" of pears, and does not invalidate the general principle that an autumn spraying is, as a rule, helpful for the control of fungal diseases of fruit trees.

* The land was ploughed towards the trees on either side, the first furrows lapping, leaving to all intents and purposes no leaves uncovered, thus obviating the necessity for digging around the trees.

These graphs also show that more *ascospores* were discharged from the Beurre Bosc leaves than from the Glou Morceaux leaves in spite of the fact previously noted that not quite such a large percentage of the former showed the disease in the previous autumn. At the time of the leaf fall the majority of the lesions on the Beurre Bosc leaves were old, and few *Fusicladium* spores could be obtained from them. On the other hand, most of the lesions on the Glou Morceaux leaves were relatively young. They looked light brown, and were very thickly scattered over the under surfaces of the leaves. *Fusicladium* spores could readily be obtained from these lesions. It would appear from these observations that the later infections did not produce so many *perithecia* as the older infections.

An attempt was made to investigate this point as follows:—Unsprayed Beurre Bosc and Glou Morceaux leaves were boiled in caustic soda (5 per cent.) to render

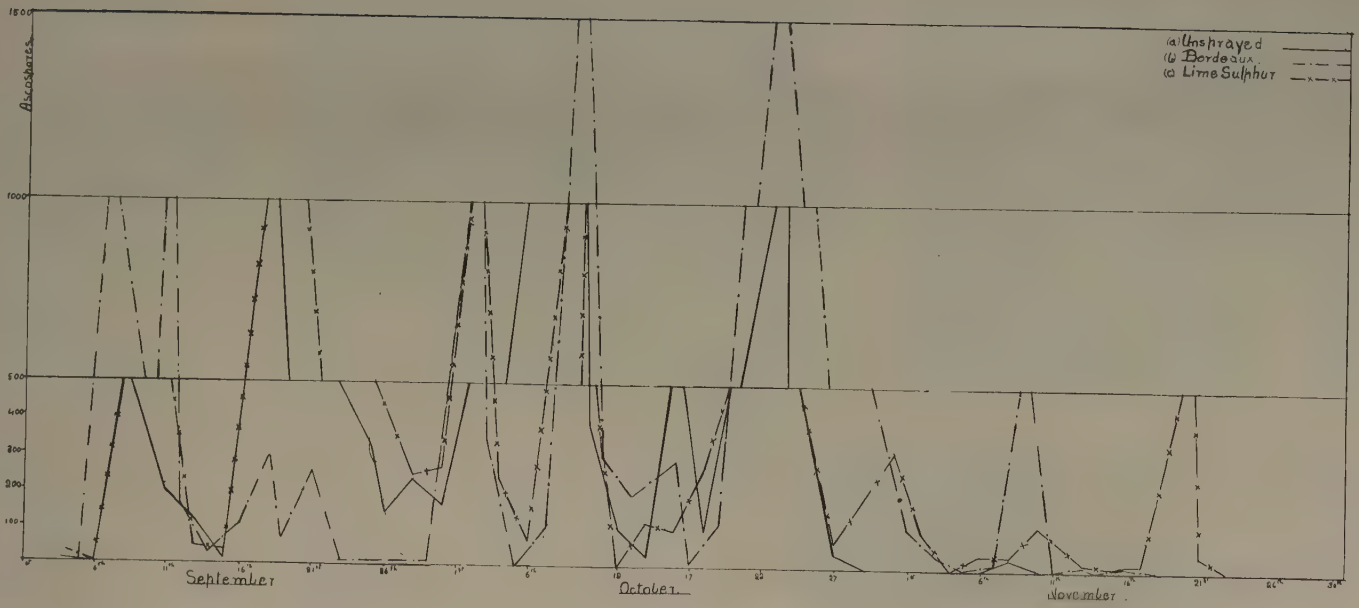



Graph I.

Graph of the *Ascospore* discharge from Glou Morceaux leaves during September, October, and November, 1932, at "Merryup," Mt. Barker—

(a) the total discharge from three unsprayed leaves;
(b) from three sprayed with Bordeaux Mixture; and
(c) from three sprayed with Lime Sulphur.

The sprayings in each case were given in the previous autumn.




Graph II.

Graph of the *Ascospore* discharge from Beurre Bosc leaves during September, October, and November, 1932, at "Merrylup," Mt. Barker

(a) The total discharge from three unsprayed leaves;

(b) from three sprayed with Bordeaux Mixture; and

(c) from three sprayed with Lime Sulphur. Both these sprayings were given in the previous autumn.

the tissue of the leaf gelatinous and leave the *perithecia* clearly exposed to view. (This method was used by Nicholls (1913), and the author is indebted to Mr. Turner, of the Department of Agriculture, Tasmania, for drawing attention to it.) The areas of pieces of treated Beurre Bosc and Glou Morceaux leaves were measured and a count was made of the total number of *perithecia* in that area. By this means an average of the number of *perithecia* per square millimeter of leaf surface was arrived at. The result is set out in the following table, and is not at all conclusive:—

TABLE OF THE AVERAGE NUMBER OF PERITHECIA PER SQUARE MILLIMETRE OF LEAF SURFACE.

| Date. | Beurre Bosc. | Glou Morceaux. |
|---|---|---|
| June ... ... ... ... ... | 2·4 | 2·25 |
| July ... ... ... ... ... | 3·5 | 4·5 |
| August ... ... ... ... ... | 5·5 | ... |
| September ... ... ... ... | 3·7 | 5·3 |
| November ... ... ... ... | 4·3 | 3·0 |
| February ... ... ... ... | 5·0 | 4·4 |

This experiment was repeated, using leaves sprayed with Lime Sulphur and with Bordeaux Mixture in the autumn, and leaves which had not been sprayed. The following results were obtained:—

TABLE OF AVERAGE NUMBER OF PERITHECIA PER SQUARE MILLIMETRE OF LEAF SURFACE IN SPRAYED AND UNSPRAYED LEAVES.

| Date. | | Unsprayed. | Lime Sulphur | Bordeaux. |
|---|---|---|---|---|
| June, 1932 ... | Average No. per sq. mm. ... | 2·7 | 3·2 | 1·2 |
| | Average diameter ... ... | 39 μ | 46 μ | 39 μ |
| | Range ... ... ... ... | 14-65 μ | 21-73 μ | 29-58 μ |
| July, 1932 ... | Average No. per sq. mm. ... | 3·7 | 4·5 | 3·8 |
| | Average Diameter ... ... | 51 μ | 61·7 μ | 56 μ |
| | Range ... ... ... ... | 21-73 μ | 21-98 μ | 14-87 μ |
| August, 1932 ... | Average No. per sq. mm. ... | 5·7 | 5 | |
| | Average Diameter ... ... | 74 μ | 62 μ | |
| | Range ... ... ... ... | 29-122 μ | 29-87 μ | |
| February, 1933 | Average No. per sq. mm. ... | 4 | 4 | 5 |
| | Average Diameter ... ... | 107 μ | 105 μ | 102 μ |
| | Range ... ... ... ... | 45-183 μ | 61-168 μ | 45-183 μ |

## PRUNING.

The second step in the control programme adopted concerns the pruning of the trees. It was assumed that the lesions on the wood might remain alive during the winter, and with the onset of spring weather produce more *conidiospores*, which would be a source of primary infection of the young leaves, twigs and fruits in the spring. The young wood was so heavily infected (between 60 and 70 per cent. of the shoots showing lesions) that it was impossible to prune out all the infected wood without considerably harming the trees. This difficulty was partially overcome as a

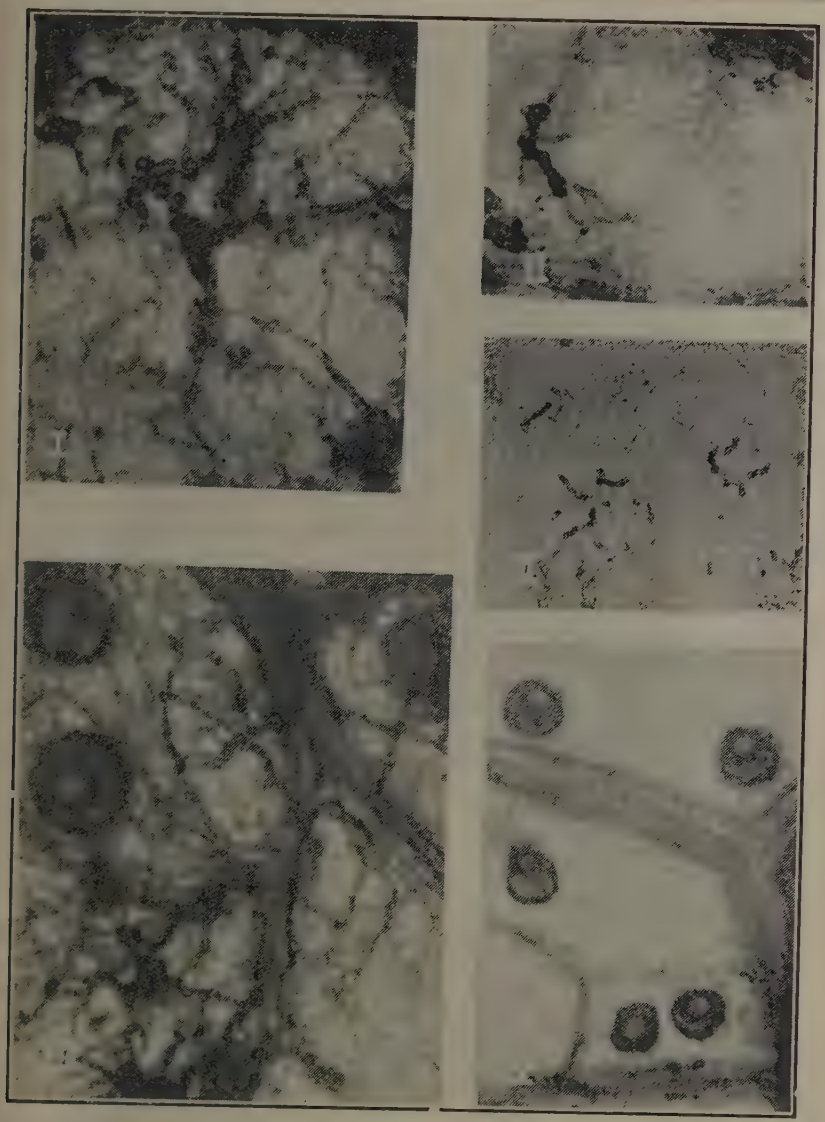


Fig. 3.—Microphotographs of *Venturia pirina* in pear leaves.

I. *Mycelium* in early stages of *perithecial* formation in Glou Morceaux leaf in July. Note knotting of *mycelium*. Mag. × 280.

II. Another photograph from the same microscope slide. Note knotting of *mycelium*. Mag. × 140.

III. Immature *perithecia* with *mycelium* in a Beurre Bosc leaf in September. Mag. × 140. (Bottom left-hand corner of block.)

IV. A group of mature *perithecia* in a Glou Morceaux leaf in September. The *ostioles* are prominent and are surrounded by a dark ring of bristles. The *mycelium* has largely disappeared. Mag. × 80. (Bottom right-hand corner of block.)

V. The stripped *epidermis* of a Beurre Bosc leaf with a young *Fusicladium* lesion showing the *conidiophores* in April. Mag. × 140.

These microphotographs are from microscope slides prepared by the caustic soda method.

*Photos. by author.*

result of an observation made by Mr. Sounness in previous years, that the pears on the outside of the trees which hung down away from the leaves were less diseased than those which grew in the centre of the trees. This might perhaps be attributed to the inability of the fungal spores to germinate without water, the pears which hang clear of the leaves being protected in some measure by being more rapidly dried after rain than those in the centre of the tree, which are sheltered by leaves. In pruning the trees an attempt was accordingly made to remove as much diseased wood as possible without undue severity, and to do so in such a way as to open out the trees and let in the sun and air, and at the same time force the fruit to the lower sides of the limbs, so that it would hang free of the leaves. The trees were pruned at the end of August, except those of Block I., which were pruned about six weeks earlier. All the trees in the orchard were similarly pruned, so that this factor was constant throughout the experiment.

## EARLY PLOUGHING.

The third measure in the control programme was an early ploughing. In planning the experiments it was assumed that the leaves from the previous year would be a source of fresh infection in the spring. The early ploughing was an attempt to get rid of this source of infection by burying the fallen leaves before the new ones developed.

Block II. (fig. 2) was situated in the midst of twenty acres of pear orchard. The whole of this orchard (including Block II.) was ploughed five inches deep. The ploughing commenced on August 30th, and was finished by September 3rd. Block I., which was left unploughed as a control, was situated about fifty yards from the rest of the pear orchard and was separated from it by some apple trees. The situation was comparable in every way. No further cultivation was carried out till November 9th., when Block II. was harrowed, two ways, with tyne harrows. After this it was worked again with disc harrows, which were followed by spring-toothed harrows. At the end of this cultivation there was a splendid loose tilth on the top, no weeds, and plenty of moisture just below the mulch. Cultivation was delayed in this manner for fear of exposing the leaves which it had been the aim of the early ploughing to bury. Not many leaves seemed to be turned up during this cultivation. On December 19th Block II. was cultivated with weeders and again on January 19th, 1933. It was cross-ploughed away from the trees on February 10th, 1933, and after this ploughing the whole orchard was worked with tyne harrows. The orchard received a dressing of blood and bone manure, 160 lbs. to the acre, after the first ploughing. The unploughed block was similarly manured at the same time.

## INCIDENCE OF THE DISEASE.

The relation between the commencement of *ascospore* discharge and the bursting of the buds on the pear trees is now briefly discussed.

The first *ascospore* discharge did not take place till September 4th. The trees on the unploughed block began to move about September 13th, a few buds were bursting by September 16th, and by September 23rd they were coming into leaf. By September 30th these leaves showed the *Fusicladium* stage plentifully. On September 24th the Glou Morceaux and Beurre Bosc trees of Block II. (ploughed) were beginning to move. The Beurre Bosc were behind the Glou Morceaux, and the trees sprayed with Bordeaux Mixture in the autumn were behind those which were not sprayed and those which were sprayed with Lime Sulphur. There was no difference between the trees sprayed with Lime Sulphur and those left unsprayed in the autumn. By September 28th the Glou Morceaux of Block II. were at the "green-tip" stage. The Beurre Bosc trees came out very unevenly, but by October

3rd the fruit buds were in an early "pre-pink" condition, and the leaf buds had hardly started to move.

BUD BURSTING DATES.

| Variety. | Date. | Stage |
|---|---|---|
| Glou Morceaux (Block I.) ... ... ... | September 13th ... | Buds moving |
| Glou Morceaux (Block I.) ... ... | September 16th ... | Buds bursting |
| Glou Morceaux (Block I.) ... ... | September 23rd ... | In leaf |
| Glou Morceaux (Block II.) ... ... | September 24th ... | Buds moving |
| Beurre Bosc (Block II.) ... ... ... | September 24th ... | Buds moving |
| Glou Morceaux (Block II.) ... ... | September 28th ... | "Green-tip" |

The *Fusicladium* stage was first noted on Block I. (unploughed) on September 30th, and did not appear on the unsprayed trees of Block II. (ploughed) till October 17th, when one infected leaf was found on an unsprayed Beurre Bosc tree. On October 24th there was a general outbreak of the *Fusicladium* stage throughout the ploughed plot. The Beurre Bosc trees showed more *Fusicladium* lesions at first than the Glou Morceaux. The disease first appeared on the under surfaces of the leaves, but on October 25th it was showing plentifully on the young Beurre Bosc fruit. The Glou Morceaux trees on Block II. were in flower at this date, the disease being very plentiful on the under surfaces of the leaves.

## RESULT OF EARLY PLOUGHING.

The percentage infection of the fruit was estimated by counting the total number of pears in a cluster, and then the number of these which were diseased. The trees on the unploughed plot flowered and set their fruit just as well as those on the ploughed plot, but before the pears were the size of a marble the stalk *became so badly infected with the disease that it withered and the whole crop fell off,* with the exception of that on the three trees which were sprayed once with Bordeaux. The unsprayed trees on the ploughed plot (Block II.) set just as good a crop as the sprayed trees, but by November about 77 per cent. of these pears were diseased; and by February there were no pears on these trees which were free of disease, and no marketable fruit was obtained from them. In this experiment, therefore, *ploughing before the buds burst prevented the disease from causing the whole crop to fall before maturity, but it did not prevent 100 per cent. of the fruit from showing the ravages of the disease.* However, it can be recognised as quite a valuable measure in a programme for controlling "Black Spot" of pears in this State.

TABLE OF PERCENTAGE OF INFECTION OF FRUIT ON UNSPRAYED TREES.

| Date. | Block II. (Ploughed). | | Block I. (Unploughed). |
|---|---|---|---|
| | Beurre Bosc. | Glou Morceaux. | Glou Morceaux. |
| September 30th ... | 0 per cent.... ... | 0 per cent.... ... | Showing on leaves. |
| | (Not flowering) ... | (Not flowering) ... | (Not flowering.) |
| October 28th ... | 37·8 per cent. ... | 60 per cent. ... | 80 per cent. |
| November 2nd ... | 77 per cent. ... | 77 per cent. ... | No pears left on trees. |
| February 20th ... | 100 per cent. ... | 100 per cent. ... | No pears left on trees. |

A further experiment to gauge the efficiency of early ploughing in destroying the source of infection in over-wintering leaves, and also to find which type of spore, the *ascospore* from the over-wintered leaves, or the *conidiospore* from the wood

lesions, was chiefly responsible for the primary infection in the spring, was carried out. Microscope slides were smeared on one side with glycerine, and hung in the trees, glycerine side down because of the rain. Three slides were hung in unsprayed trees on the unploughed plot, and two in unsprayed, and one in a sprayed tree on the ploughed plot. The following are the results obtained from a periodical examination of these slides:—

TOTAL SPORES FROM PLOUGHED AND UNPLOUGHED PLOTS.

| Date. | Ploughed Plot (3 slides). | | | | Unploughed Plot (3 slides). | |
|---|---|---|---|---|---|---|
| | Conidiospores. | | Ascospores. | | Conidiospores. | Ascospores. |
| September 14th | 0 | | 0 | | 0 | 0 |
| September 21st | 0 | | 5 | | 4 | 17 |
| September 30th | 0 | | 0 | | 2 | 12 |
| | Sprayed (1 slide). | Unsprayed (2 slides). | Sprayed (1 slide). | Unsprayed (2 slides). | | |
| October 6th | 7 | | 7 | 28 | 12 | 175 |
| October 21st | 7 | | 12 | | 75 | 229 |
| November 4th | 49 | 738 | 2 | 11 | Thousands | 7 |
| November 17th | 98 | 2,306 | 0 | 4 | Thousands | 1 |
| November 24th | 68 | 563 | 1 | 0 | Thousands | 1 |
| November 30th | 104 | 1,900+ | 0 | 0 | Thousands | 0 |
| February 21st | Thousands | | 1 | | Thousands | 5 |

No spray was applied till October 3rd in 1932 season.

These figures indicate that although infection from *ascospores* was not eliminated by the early ploughing, it materially decreased the number of *ascospores* floating in the air, thus strengthening the conclusion already drawn of the value of early ploughing as a control measure.

## THE PRIMARY SOURCE OF SPRING INFECTION.

The *conidial* stage appeared on the leaves of the trees on the unploughed plot on September 30th, and on the ploughed plot on October 24th. *Fusicladium* spores were noted on leaves in a few places on unsprayed Beurre Bosc trees on the ploughed plot on October 17th. After September 30th on the slides from the unploughed plot *conidiospores* began to be plentiful, whereas before they were virtually absent. But when there were few *conidiospores* on the slides there were many *ascospores*. This seems to indicate that primary infection came from *ascospores*.

From time to time during the spring, and before the *conidial* stage was evident on the leaves, scrapings were taken from a great many twigs which appeared to have old lesions or unopened blister-like patches, and *Fusicladium* spores were never found. This confirms the conclusion drawn from the observations on the slides hung in the orchard, viz., that infection is primarily by *ascospores* from over-wintered leaves.

## THE EFFECT OF BURYING OVER-WINTERED LEAVES DURING THE SPRING.

The following experiment was carried out to determine the effect on the *ascospore* discharge of burial of the over-wintered leaves, and the consequent effectiveness of the early ploughing. On August 31st, while ploughing was in progress, some of the leaves which had been lying on the ground throughout the winter were collected and buried, at a depth of five inches, at a marked spot on one of the headlands. They were dug up on November 10th and examined frequently

till the end of the month for *ascospore* discharge, using the method already described, which was in use at the same time for the observations on the unburied leaves. The latter discharged *ascospores* throughout November, and possibly later, but no discharge was found to occur in the case of the leaves which had been buried. It would appear, therefore, that infected leaves are rendered innocuous by burial for ten weeks, so that there is no danger in exposing them by cultivation after they

Fig. 4.—Stages of Apple Blossom Development.

1. "Green-tip," "delayed dormant" or "spur-burst." 2. "Tight-cluster." 3. "Open-cluster" or "pre-pink." 4. "Pink." 5. "Full-bloom." 6. "Petal-fall." 7. "Calyx-closed." *After the drawing by N. J. Adamson, in Cunningham's "Fungous Diseases of Fruit Trees."* When deciding the correct stage to apply any spray always choose the period when the *majority* of the spurs are at the stage required.

Although these drawings are of apple blossom development, they may be taken to apply in a general way to the development of pear blossoms also.

have been buried for this period. The minimum period after which cultivation can be carried out with safety was not determined.

These observations were confirmed by an examination of the *perithecia* in these buried leaves. By boiling the leaves in caustic soda (5 per cent.), as already described, it is possible to see the *perithecia* clearly. Over fifty *perithecia* were dissected from treated leaves and squashed, no *ascospores* being found. These *perithecia* were of mature size (90-100 $\mu$) and similar in appearance to those which did contain *ascospores*.

Leaves that were turned up by the plough in August, 1932, were examined in the same way. They were found to contain *perithecia* of mature size but no *ascospores*.

These results may be interpreted as follows: leaves buried in the ground would be kept wet, so that as soon as the *ascospores* became mature conditions would favour a discharge. Leaves above the ground, on the other hand, would usually be dry for some period of the day, and these dry periods might check the discharge, the leaves accordingly continuing to discharge intermittently for a much longer period.

## SPRAY SCHEDULE.

The fourth part of the control programme was a spray schedule based on that recommended by Mr. H. A. Pittman (Pittman, 1930) and is set out in the following table:—

GLOU MORCEAUX SPRAY SCHEDULE.

| Date. | Plot. | Spray. | Strength. | Stage. | Weather. | Max. Temp | Rel. Humidity. |
|---|---|---|---|---|---|---|---|
| Sept. 28th ... | A2 and C | Bordeaux ... | 5—4—50 | "Green-tip" | Good drying | ... | ... |
| Sept. 29th ... | B2 | Lime-Sulphur | 1 in 15 | "Green-tip" | Dull and cool | ... | ... |
| Oct. 7th ... | B2 | Lime-Sulphur | 1 in 35 | Pre-pink to pink | Dull, windy and cold | ... | ... |
| Oct. 11th ... | A2 and C | Bordeaux ... | 3-4-50 | do. do. | Dull but dry | ... | ... |
| Oct. 27th ... | B2 | Lime-Sulphur | 1 in 50 | Petal-fall ... | Rather hot and sunny | 82° F. | 49 |
| Oct. 27th ... | A2 and C | Bordeaux ... | 3-4-50 | do. ... | do. | 82° F. | 49 |
| Nov. 10th ... | A2 and C | Bordeaux ... | 3-4-50 | 10 days after petal-fall | Sunny but cool | 69° F. | 54 |
| Nov. 10th ... | B2 | Lime-Sulphur | 1 in 50 | do. do. | do. | 69° F. | 54 |
| Dec. 13th ... | C | Bordeaux ... | 3-4-50 | 1 month after last spray | Dry ... ... | ... | ... |

BEURRE BOSC SPRAY SCHEDULE.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Oct. 3rd ... | A1 | Bordeaux ... | 5-4-50 | Early pre-pink | Sunny and windy | ... | ... |
| Oct. 3rd ... | B1 | Lime-Sulphur | 1 in 15 | do. | do. | ... | ... |
| Oct. 24th ... | A1 | Bordeaux ... | 3-4-50 | Petal-fall ... | Sunny and warm | 70° F. | 72 |
| Oct. 25th ... | B1 | Lime-Sulphur | 1 in 50 | do. ... | Warm, dull, with misty rain at times | 62° F. | 69 |
| Nov. 3rd ... | A1 | Bordeaux ... | 3-4-50 | Ten days after Petal-fall | Sunny but cool | 69° F. | 66 |
| Nov. 3rd ... | B1 | Lime-Sulphur | 1 in 50 | do. | do. | 69° F. | 66 |

The Lime Sulphur applied to the Beurre Bosc trees on October 3rd and October 25th caused a slight amount of leaf burn, but the fruit was not, at least directly, injured. No other spray injury resulted from the above programme. It is very important to note that Bordeaux Mixture was never used during rain.

In planning this spray schedule the main idea was to protect the trees from infection. Sprays are only preventive measures, and cannot cure. The young leaves can be attacked by the fungal spores as soon as the buds burst, but if the surface of these young leaves is first covered with spray, the spores, although they may still be on the leaves, cannot germinate successfully. As the leaves and fruit grow, more surface is exposed to the chance of infection, and further spray has to be applied to protect the newly developed surface. It can be seen from the above programme that, during the early growth of the leaves and fruit, spray was applied as often as was practicable.

The spray was applied at the rate of approximately two gallons per tree.

COST OF SPRAYING.

| Stage. | Bordeaux. | Lime Sulphur. |
|---|---|---|
| | d. | d. |
| "Green-tip" spray cost per tree ... ... ... | 1·13 | 3·12 |
| "Pink" spray cost per tree ... ... ... | 0·81 | 1·46 |
| "Petal-fall" spray cost per tree ... ... ... | 0·81 | 1·08 |
| "Ten Days after" spray cost per tree ... ... | 0·81 | 1·08 |
| Total Cost of Material per tree ... | 3·56 | 6·74 |

TABLE OF PERCENTAGE OF INFECTION ON EXPERIMENTAL PLOT.

| Date. | Beurre Bosc (Ploughed). | | | Glou Morceaux (Ploughed). | | | |
|---|---|---|---|---|---|---|---|
| | Unsprayed. | Bordeaux. | Lime Sulphur. | Unsprayed. | Bordeaux. | Lime Sulphur. | Unsprayed and Unploughed. |
| 1932. | | | | | | | |
| Sept. 30th ... | ... | ... | ... | ... | ... | ... | On leaves |
| Oct. 17th ... | On leaf | ... | ... | ... | ... | ... | On leaves |
| Oct. 24th ... | On leaf | On leaf | On leaf | On leaf | On leaf | On leaf | On leaf and flowers |
| Oct. 25th ... | On fruit | On fruit | On fruit | Still flowering | Still flowering | Still flowering | On leaf and flowers |
| | | | Percentage on fruit. | | | | |
| Oct. 28th ... | 37·8% | 20% | 28% | 60% | 14% | 5·7% | 80% |
| Nov. 2nd ... | 87% | 39% | 28% | 62·7% | 8% | 11% | 100% |
| * | | Shield Expt. Row. Row. | Shield Expt. Row. Row. | | Shield Expt. Row. Row. | Shield Expt. Row. Row. | |
| Nov. 19th ... | 77% | 22·7% 26·7% | 18·4% 18% | ... | ... ... | ... ... | No pears left on trees |
| Nov. 21st ... | ... | ... ... | ... ... | 77% | 17·8% 27% | 23% 19·4% | No pears left on trees |
| | This condition was maintained till after Jan. 19th, when lin. ran in fell. | | | | | | |
| 1933. | | | | | | | |
| Feb. 20th ... | 100% | 20% 30% | 94% 96% | 100% | 18% 23% | 46% 48% | No pears left on trees |

The estimates of percentage infection on fruit quoted were arrived at in the following manner. The number of pears in a cluster was counted, and then the number of these that showed lesions was noted. About fifty clusters were counted from a number of representative trees in any one plot, and then a percentage was taken. The last estimate on February 20th was arrived at by counting the total number of pears on a typical tree and then the total number showing the disease. Three typical trees were counted in each row of each plot.

* From Nov. 19th the percentages of infection for the shield and experiment rows were recorded separately.

## COMPARISON OF BORDEAUX MIXTURE AND LIME SULPHUR AS CONTROLS.

It can be seen from this table that the appearance of the disease on the ploughed plot was simultaneous throughout, but that the intensity of the attack was considerably modified by the use of sprays. The disease was, at first, less severe on the Glou Morceaux than on the Beurre Bosc, but later they were about equally affected. In November those Beurre Bosc trees sprayed with Lime Sulphur showed rather less disease than those sprayed with Bordeaux Mixture. This condition held till January when there were some heavy rains. After this, new lesions appeared rapidly on those trees which had been sprayed with Lime Sulphur but virtually no new lesions appeared on the trees which had been treated with Bordeaux Mixture. This showed *that Bordeaux Mixture did not lose its protective value over a period of nearly four months* whereas Lime Sulphur did.

## DIFFERENCE IN SUSCEPTIBILITY OF THE TWO VARIETIES USED.

The Beurre Bosc pears were picked at the end of February but the Glou Morceaux were not picked till a month later. In February there was not much difference in the percentage of infection on the two varieties where both were sprayed with Bordeaux Mixture but the Glou Morceaux which had been sprayed with Lime Sulphur showed much less disease than the Beurre Boscs which had received the same treatment. The Glou Morceaux cannot be so susceptible to late infection.

## EXPLANATION OF THE DIFFERENCE IN THE SPRAY SCHEDULE USED ON THE TWO DIFFERENT VARIETIES.

The Beurre Bosc trees received only three applications of Bordeaux Mixture, whereas the Glou Morceaux received four, yet the results are sufficiently alike to come within the bounds of experimental error. This seems to indicate that the extra spraying was of no value to the Glou Morceaux trees. However, there was no "green-tip" stage with the Beurre Bosc. The first buds to open were the flower buds on October 3rd, with the few leaves that accompany them. Therefore an earlier spraying would have accomplished nothing. With the Glou Morceaux there was a definite "green-tip" stage, when the leaf buds were opening, about September 28th, before the flower buds began to move. The "green-tip" spray protected these opening leaves from an early attack. At the time that this spray was applied, *ascospores* were being discharged from the over-wintered leaves, and a few were about on the ploughed experimental plot. The *Fusicladium* stage was already to be found on the unploughed plot where *ascospores* had been common for about ten days. The conidial stage was not found generally on the ploughed plot till October 24th, but some lesions were found on unsprayed Beurre Bosc trees on October 17th.

## THE SPREAD OF THE DISEASE BY CONIDIOSPORES.

In the last two estimates of the percentage of the disease an attempt was made to find what difference there was between the percentage infection on the experiment rows and the shield rows, which latter, it will be remembered, were situated between the experiment and control rows (Fig. 2). In December the shield rows in the Bordeaux plot showed less "Black Spot" than the experimental rows, but with the Lime Sulphur plot the reverse was the case. By February the shield rows all through were less diseased than the experimental rows. This is a curious result of which there seems no obvious explanation. In some cases the figures come well within the bounds of experimental error, but it is curious that the error is constantly in one direction. The shield and experimental rows were treated identically, the spray coming out of the same barrel, and being applied simultaneously. This consistent result makes it evident that the disease did not spread

from the heavily diseased control trees to the shield rows at all, and so seems to support Dr. W. J. Dowson's view (indicated to the writer in correspondence) that the *conidiospores* (*Fusicladium pirina*) are only splashed about by rain and are not air-borne. These spores could easily be splashed from one leaf or pear to another on the same tree by rain, but could not so easily be carried from one tree to another in this fashion. This conclusion is also borne out by the results obtained from slides hung in the trees on the ploughed plot.

TABLE OF NUMBER OF FUSICLADIUM SPORES FOUND ON SLIDES HUNG IN NEIGHBOURING TREES ON THE PLOUGHED PLOT.

| Date. | Beurre Bosc. Unsprayed. | Beurre Bosc. Bordeaux. | Glou Morceaux. Unsprayed. |
|---|---|---|---|
| November 4th ... ... | 561 | 49 | 177 |
| November 16th ... ... | 1,017 | 98 | 1,289 |
| November 24th ... ... | 355 | 68 | 208 |
| February 21st ... ... | Thousands | 135 | 470 |

These three trees were in neighbouring rows, but the slide in the tree which showed the least "Black Spot," *i.e.*, the sprayed tree, never seemed to collect spores from the neighbouring heavily infected trees, but as this tree became more and more diseased the number of spores collected on the slide increased. Fresh slides were hung in these trees on February 20th and removed on February 24th. These slides showed practically no *Fusicladium* spores although all the trees were heavily infected at this date. During these four days no rain fell, and this may account for the lack of spores on the slides.

DETAILS OF THE PERCENTAGE INFECTION OF THE FRUIT.
20th FEBRUARY, 1933.

| Variety. | Treatment. | Row. | Perfect. | Plain. | Market-able. | Un-market-able. |
|---|---|---|---|---|---|---|
| | | | % | % | % | % |
| Beurre Bosc ... | Bordeaux in "Early Pre-pink," "Petal-fall," and "10 days later" stages. Ploughed early | Experiment ... | 70 | 20 | 90 | 10 |
| | | Shield ... ... | 80 | 12 | 92 | 7 |
| | | Control ... (not sprayed) | 0 | 0 | 0 | 100 |
| Beurré Bosc ... | Lime Sulphur in "Early Pre-pink," "Petal-fall," and "10 days later" stages. Ploughed early | Experiment ... | 3 | 65 | 68 | 31 |
| | | Shield ... ... | 6 | 59 | 65 | 35 |
| | | Control ... (not sprayed) | 0 | 0 | 0 | 100 |
| Glou Morceaux... | Lime Sulphur in "Green-tip," "Pink," "Petal-fall," and "10 days later," stages. Ploughed early | Experiment ... | 52 | 29 | 81 | 18 |
| | | Shield ... ... | 54 | 27 | 81 | 19 |
| | | Control ... (Not sprayed) | 0 | 0 | 0 | 100 |
| Glou Morceaux... | Bordeaux in "Green-tip," "Pink," "Petal-fall," and "10 days later" stages. Ploughed early | Experiment ... | 77 | 12 | 89 | 11 |
| | | Shield ... ... | 81 | 9 | 90 | 9·6 |
| | | Control ... (not sprayed) | 0 | 0 | 0 | 100 |
| Glou Morceaux... | Bordeaux in "Green-tip," "Pink," "Petal-fall," "10 days later," and "one month later" stages. Ploughed early | ... ... ... | 89·6 | 3·8 | 93 | 6·8 |
| Glou Morceaux... | Unploughed till late, and unsprayed | ... ... ... | Crop failed to mature on account of the disease. | | | |
| Glou Morceaux... | Unploughed till late and sprayed with Bordeaux in early "Pre-pink" stage | ... ... ... | 29 | 39 | 68 | 31·6 |

### DEFINITION OF "PLAIN" AND "MARKETABLE."

The definition of "plain" used was that laid down in the Commonwealth regulations for the export of pears, namely, that pears with "Black Spot" may be exported if the total area of the lesions on the pear will fit inside a circle of a quarter inch diameter. In the table "plain" plus "perfect" gives marketable.

### A FIFTH SPRAYING WITH BORDEAUX MIXTURE.

This table shows that an additional spraying with Bordeaux 3-4-50 applied one month after the last spray was applied to the rest of the plot, increased the percentage of perfect fruit by about 10 per cent. This shows that although the protection afforded by four sprayings with Bordeaux was very much more efficient than that afforded by the same number of applications of lime sulphur, after a lapse of nearly four months; the efficiency of the Bordeaux could be improved by a later application. This last application of Bordeaux, as in every one but the first (5-4-50) was at a strength (3-4-50) which is a good deal below that which is normally used in this State, and yet it proved very efficient and did not injure the fruit as a stronger solution often does. It was not considered practicable to spray with lime sulphur at this time, as much damage to the fruit might result if a hot day followed an application. Therefore treatment with lime sulphur must perforce cease by December, in this State.

### NO EARLY PLOUGHING AND ONE APPLICATION OF BORDEAUX.

The result obtained by spraying once in the early "pre-pink" stage with Bordeaux 5-4-50, on trees which were not ploughed around till December is remarkable, and speaks very well for the efficiency of Bordeaux mixture. The trees surrounding these three, failed to mature any crop at all. These trees, sprayed once, not only set a crop, but about 30 per cent. of it was free of disease, and 40 per cent., though diseased, could be marketed as "plain." This of course is not nearly an efficient enough control measure alone for practical use, but it does show what a considerable amount of protection is afforded by Bordeaux mixture. At the time the spray was applied the leaves which had been out for nearly a week, *i.e.*, those on the ends of the leaders, etc., were showing black spot lesions, so that the disease already had a hold on the trees before the spray was applied. It would appear from this result that spraying with Bordeaux mixture is a more important feature of a control programme for "Black Spot" than early ploughing. The trees which were ploughed around early set their fruit and matured it but none of it was marketable, but the trees which were left unploughed till late, but received one application of Bordeaux mixture, not only matured a crop, but about 65 per cent. of that crop was marketable. In considering a control programme for "Black Spot" the value of an early ploughing should not be under-estimated as that alone made the difference between no crop at all and a crop which matured, but was diseased.

### OBSERVATIONS ON THE AMOUNT OF INFECTION ON WOOD AND LEAVES THROUGHOUT THE EXPERIMENTAL PLOT IN FEBRUARY, 1933.

*Wood.*—The wood on the Glou Morceaux of the unploughed block was very heavily infected; on the unsprayed trees of the ploughed plot lesions were plentiful but were not nearly as prevalent as on the unploughed plot. The Glou Morceaux trees sprayed with lime sulphur showed a few wood lesions, and some were to be found on the wood of trees which had four applications of Bordeaux Mixture, but scarcely any on trees that had the fifth application of Bordeaux Mixture.

The unsprayed Beurre Bosc trees had all the young wood heavily infected with "Black Spot," and on the trees sprayed with lime sulphur hardly a twig was to be found without lesions, but the wood of trees sprayed with Bordeaux Mixture, although showing many lesions, was not so badly infected.

In each section of the experiment the wood of the Beurre Bosc was more heavily infected than that of the Glou Morceaux.

*Leaves.*—The leaves on the trees of the unploughed and unsprayed Glou Morceaux plot were so badly infected that they looked blackened and withered even from a distance. These leaves on closer examination proved to be covered on the under surface with a fine peppering of small new light-brown and many older lesions. The unsprayed Glou Morceaux trees of the ploughed plot also showed the peppering of new lesions on the under surface. These lesions occurred on the leaves of trees sprayed with lime sulphur, and to a less extent on those trees which had had four applications of Bordeaux Mixture, and to a still less extent again on those which had received five applications of Bordeaux Mixture.

The same was found to hold throughout the Beurre Bosc plots but in each case the Beurre Bosc trees were more heavily infected than the Glou Morceaux. On the whole Beurre Boscs seem much more susceptible to the disease than Glou Morceaux.

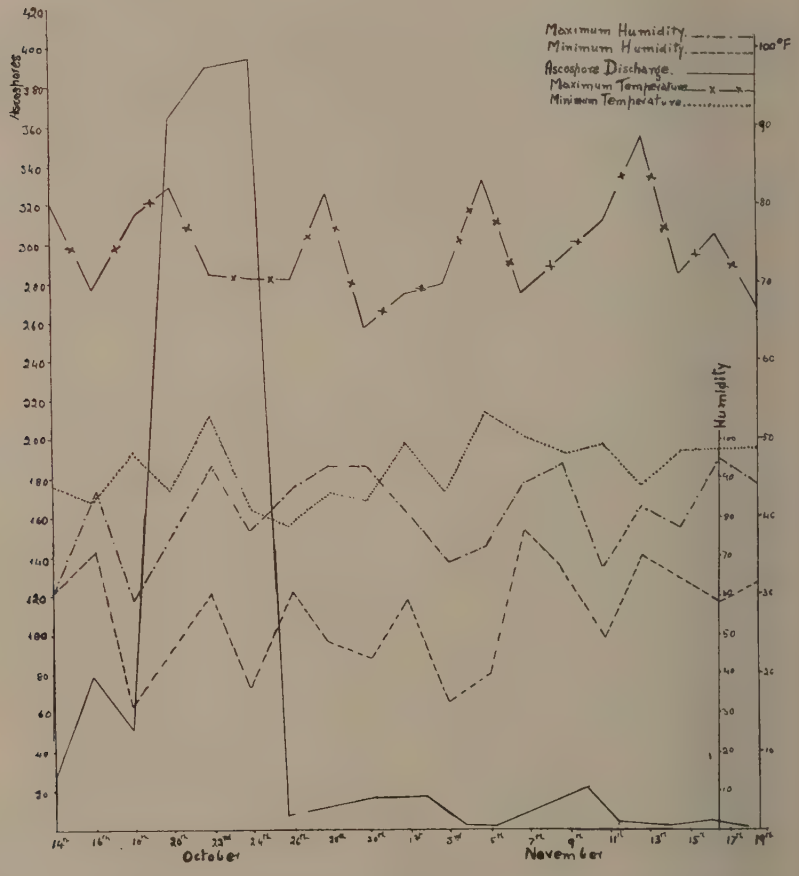
## NOTES ON SPRAYING CONDITIONS AND SPRAY INJURY.

It was found that the Beurre Bosc were more susceptible to injury by lime sulphur than Glou Morceaux. Beurre Bosc trees were sprayed with lime sulphur 1-50 on October 25th. On October 27th, in the heat of the day (max. temp. 82deg. F.) Glou Morceaux trees were sprayed with lime sulphur 1-50. The latter suffered no ill effects in spite of the fact that it is considered dangerous to use lime sulphur if the temperature is over 75deg. F., whereas the former suffered some leaf burn during the heat of October 27th. October 25th was rough and windy in the morning but still and warm in the afternoon. Spraying was carried on all day on the Beurre Boscs, and those trees which were sprayed in the afternoon did not suffer as severely in the heat of October 27th as those sprayed in the morning. When spraying in a wind, to be at all thorough, the nozzles have to be held close to the limbs, and so the spray reaches the leaves with greater force and in greater quantity. This may account for the extra burning suffered by those trees sprayed in windy weather.

## NOTES ON THE CONTROL OF THE DISEASE ON OTHER VARIETIES.

In the same orchard, Duyonne du Comice, Winter Nelis, Josephine and L'Inconnue trees received a "pink" spray and a "petal-fall" spray of 3-4-50 Bordeaux mixture. The L'Inconnue and Winter Nelis, both varieties which are susceptible to the disease, at the beginning of December showed very little "Black Spot" on either fruit or leaves; this condition held till February. The orchard had of course as stated earlier, received the early ploughing treatment. Josephine is a fairly resistant variety and on the same date showed virtually no leaf lesions, but an appreciable amount of the fruit was infected. The Duyonne du Comice is also a resistant variety. One section of this variety did not receive a "pink" stage spray. This section showed much more "Black Spot" at picking time, at the end of February, than the trees which received both sprayings. The "petal-fall" spray was applied (on a windy day) to the section which

had missed the "pink" stage spray, and by December quite a number of the pears showed shiny, black, blister-like patches which have been attributed to Bordeaux burn. At picking time some of these pears were badly russetted. On these varieties a "pink" and a "petal-fall" spray with Bordeaux Mixture along with the early ploughing seem to have proved a fairly successful control programme for the disease, in this season at Mt. Barker. This result is not con-




Graph III.

Graph of average *Ascospore* discharge from six Beurre Bosc leaves, and the maximum and minimum temperatures and humidities for October and November, 1932, at "Merryup," Mt. Barker.

clusive, however, as no trees of the varieties referred to were left unsprayed as controls. However, an increase in the amount of disease present was noted when the "pink" stage spray was omitted from the treatment of the Duyonne du Comice. This indicates that the "pink" stage spraying was of value as a control measure.

## THE INFLUENCE OF RAIN, HUMIDITY AND TEMPERATURE ON ASCOSPORE DISCHARGE.

Counts were taken of the number of ascospores discharged over a forty-eight hour period. A count was taken from nine leaves one day and from nine other leaves the next day, by the method described previously, from August to December. Rainfall was noted at 9 a.m. each day during this period, and a reading of the maximum and minimum temperatures, and of the humidity, was taken each day at 9 a.m. and 5 p.m. from October 15th to December.

An attempt has been made to correlate these factors with ascospore discharge. However, no correlation was found between the temperature, or the humidity, and ascospore discharge. (See Graph III.)

There is a general similarity between the graphs of ascospore discharge and the rainfall, but no very definite relation. There seems to be a peak period in the discharge of the *ascospores* about every ten days, regardless of the amount of rain. Some rain, even if it was only half a point, which occurred as dew, was recorded on every day except two during the whole three months. There was no dry period in which to determine whether the lack of rain would check the discharge of *ascospores*. (See Graph IV.)

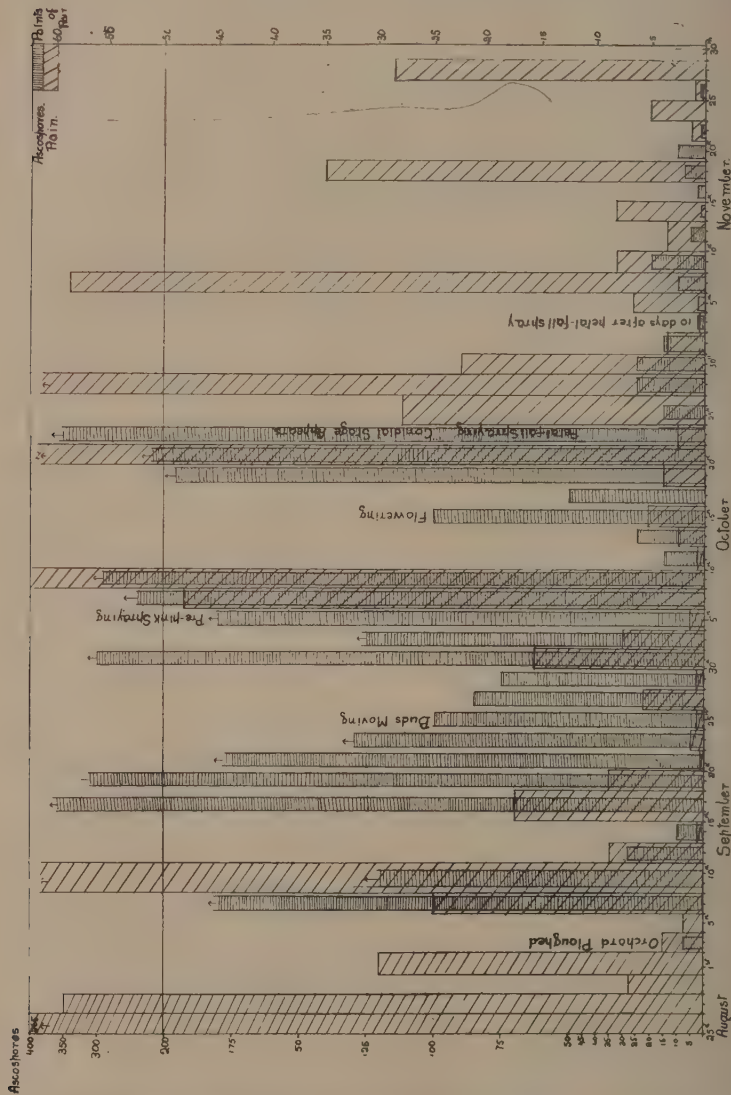
## LIFE HISTORY OF VENTURIA PIRINA (ADERHOLD) AS OBSERVED IN WESTERN AUSTRALIA.

The *Fusicladium* or summer stage of the fungus occurs on the leaves, fruit, and young wood of the pear tree. It occurs as velvety black patches on each of these parts. The *mycelium* at this stage is very fine, colourless, branching, and sparsely septate. It lies between the epidermis and the cuticle, and masses of *mycelium* are often associated with stomates. This *mycelium* gives rise to *conidiophores*, which grow up through the cuticle, and bear *conidiospores*. These *conidiophores* are short, twisted and gnarled. The spores are budded off from these gnarled parts sympodially. (See Fig. 6.) The *conidiospores* known as *Fusicladium pirinum* (Aderhold) are boat-shaped, and dark brownish-green in colour. The average size of these spores is 18 x 7.4$\mu$ and they range between 23 x 8.2$\mu$ and 11 x 6 $\mu$

After the leaves have fallen from the trees, about the end of May in W.A., the *mycelium* penetrates the dead tissue of the leaf, becomes stouter, more septa appear, and it begins to knot up and form the beginnings of *perithecia*. (See Fig. 5). In June the immature *perithecia* were easily recognisable, and had an average diameter of about 45$\mu$. *Perithecia* of this size were plentiful, as many as three per square millimetre of leaf surface, having been found.

TABLE OF PERITHECIAL DEVELOPMENT.

| Variety. | Date. | Average No. per sq. mm. | Average Diameter. | Range. |
|---|---|---|---|---|
| Beurre Bosc ... ... | June, 1932 | 2·4 | 44·5$\mu$. | 21·9$\mu$.—146$\mu$. |
| Glou Morceaux ... ... | June, 1932 | 2·25 | 36·7$\mu$. | 14·6$\mu$.—65$\mu$. |
| Beurre Bosc ... ... | July, 1932 | 3·5 | 50$\mu$. | 21·9$\mu$.—80$\mu$. |
| Glou Morceaux ... ... | July, 1932 | 4·5 | 62·8$\mu$. | 14·6$\mu$.—189$\mu$. |
| Beurre Bosc ... ... | Aug., 1932 | 5·5 | 70$\mu$. | 29$\mu$.—122$\mu$. |
| Glou Morceaux ... ... | Aug., 1932 | ... | ... | ... |
| Beurre Bosc ... ... | Sept., 1932 | 3·7 | 90·9$\mu$. | 30$\mu$.—137$\mu$. |
| Glou Morceaux ... ... | Sept., 1932 | 5·3 | 89$\mu$. | 30$\mu$.—153$\mu$. |
| Beurre Bosc ... ... | Nov., 1932 | 4·3 | 99·9$\mu$. | 45$\mu$.—168$\mu$. |
| Glou Morceaux ... ... | Nov., 1932 | 3 | 85·6$\mu$. | 45$\mu$.—137$\mu$. |
| Beurre Bosc ... ... | Feb., 1933 | 5 | 106·5$\mu$. | 45$\mu$.—183$\mu$. |
| Glou Morceaux ... ... | Feb., 1933 | 4·4 | 102$\mu$. | 61·8$\mu$.—168$\mu$. |




Graph IV.

A Graph of the Average *Ascospore* discharge from six Beurre Bosc leaves and the Rainfall at "Merryup," Mt. Barker, during August, September, October and November, 1932. When more than five hundred *ascospores* occurred, five hundred were used in the calculation, the exact number of spores in excess of this number not being recorded.

None of these *perithecia* were mature till the beginning of September. The first discharge of *ascospores* took place on September 4th.

The *perithecia* are flask-shaped, and have an *ostiole* which is apparent from the time the *perithecium* is quite small (about 60$\mu$ in diameter). At maturity this *ostiole* terminates a neck, which is beset with stiff bristles. This neck penetrates the cuticle of the leaf, and through it the *ascospores* are discharged. The *perithecia* contain *asci*, or sausage-shaped sacs, each of which contains eight *ascospores*. The *asci* are produced in great numbers within the *perithecium*, and when the spores have been discharged the *asci* cannot be found within the *perithecium*. *Asci* with half their spores discharged have been found within *perithecia*, which also contained

*asci* which had not started to discharge. The average size of an undischarged *ascus* is about 48 $\mu$.

The *ascospores* are olive-green in colour, unequally two-celled, the smaller cell being about one-third the length of the spore. The widest part of the spore is also

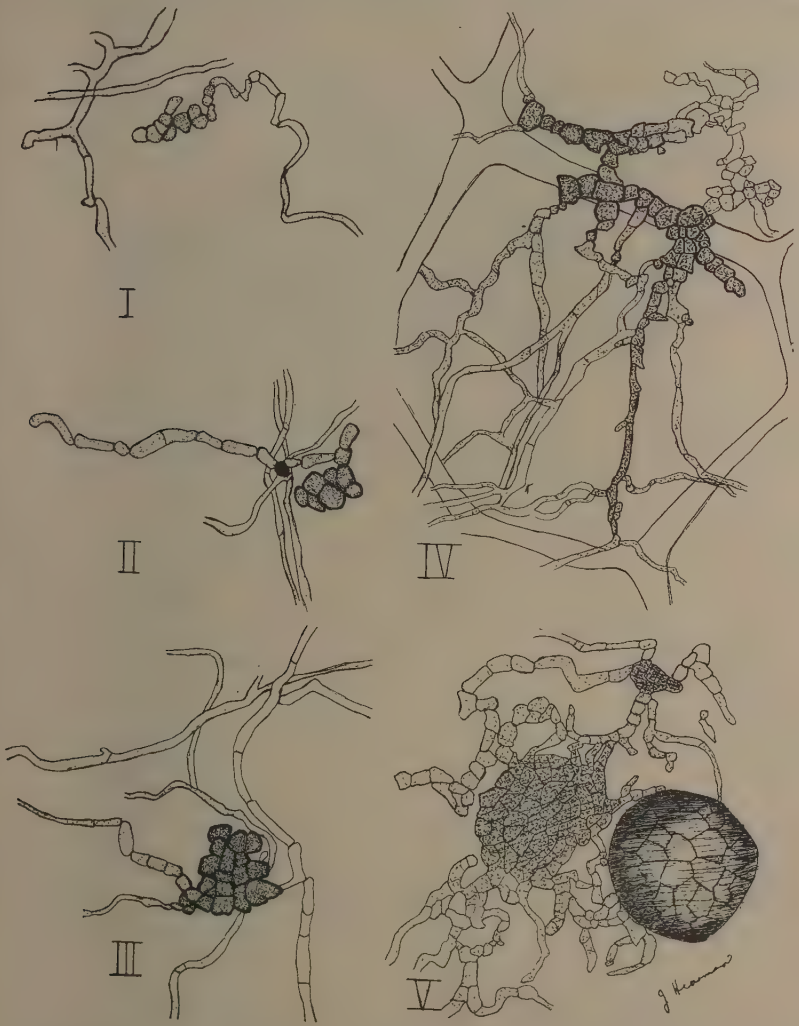



Fig. 5.

*Mycelium* of *Venturia pirina* in Beurre Bosc pear leaves. These leaves have been prepared by boiling in caustic soda (see text). Mag. × 410.

I., II., III., & IV. Early stages in perithecial formation in June.

V. Further stages in perithecial formation in July. (*Camera lucida drawings.*)

about one-third of the total length. The largest cell is always uppermost in the *ascus*. The average size of an *ascospore* is 12 x 4 $\mu$.

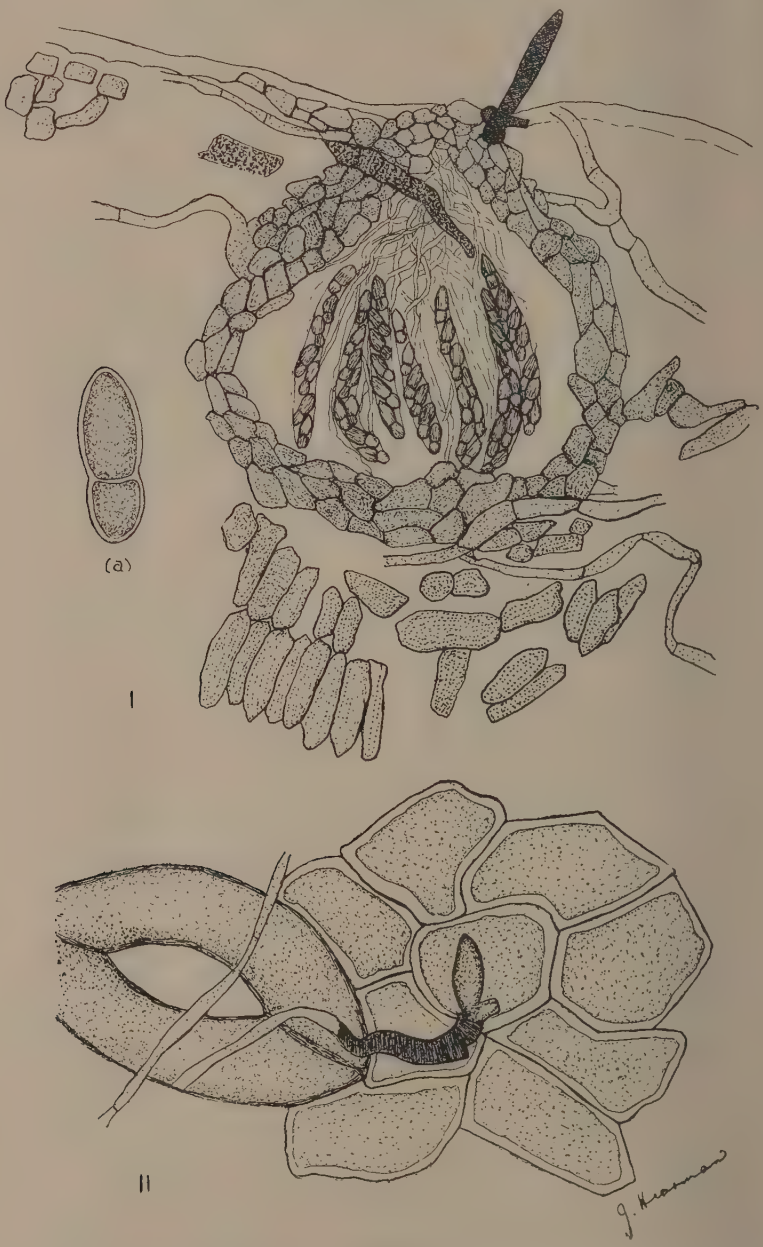



**Fig. 6.**

I. T.S. of an almost mature *perithecium* of *Venturia pirina* containing *asci* with *ascospores*. Note bristles at apex of *perithecium*. Mag. × 385.

(a) *Ascospore*. Mag. × 2080.

II. Portion of stripped *epidermis* of Beurre Bosc leaf showing strands of *mycelium* and a *conidiophore* budding off a *conidiospore*. Note stomate or breathing pore. Mag. × 770. (*Camera lucida drawings.*)

It has been observed from serial sections of *perithecia* at all stages of maturity that structures which are probably *paraphyses* are present in the immature *perithecia*. They are longer and more slender than the young *asci*, which stain more deeply with haematoxylin. At first they seem to occupy most of the young *perithecium*, but as the *asci* develop they become less and less evident, till in the mature *perithecium* they have practically disappeared. Accounts of *Venturia pirina* do not usually mention *paraphyses*. In descriptions of the genus *Venturia* Stevens (Stevens 1925) says *paraphyses* usually absent, while Lindau (Lindau 1897) refers to them as vanishing.

In November, when the discharge of *ascospores* had practically ceased, spores would appear on the slides, in groups, as if they had all come from one *perithecium*. The discharge would commence with quite a small number of spores, say twenty. In the next forty-eight hours the discharge, presumably from this *perithecium*, might be as much as seven hundred spores, and in the following forty-eight hours there might be only forty spores discharged, and then no more spores would be found on this portion of the slide. Thus the discharge from a single *perithecium* apparently occupied five to six days.

## SUMMARY OF CONCLUSIONS.

The following are the conclusions drawn from the above investigation, but they cannot, without further confirmation, be held to be of general application in this State, although this is probably the case:—

*Fungal Infection.*

i. *Ascospores* were the chief source of primary infection in the spring.

ii. Wood lesions did not appear to carry the fungus over from season to season in these experiments.

iii. *Ascospores* were first discharged on 4th September, *i.e.*, nearly one month before the "green-tip" stage was reached by the pear trees.

iv. They continued to be discharged from the leaves left on the surface of the ground during the spring for three months.

v. More *ascospores* were discharged from leaves sprayed during the previous autumn than from those which were not.

vi. Leaves buried at the beginning of September had discharged all their *ascospores* after remaining buried for two months.

vii. No close correlation could be demonstrated between *ascospore* discharge and weather conditions at Mt. Barker, which were humid during the whole period over which the observations were made.

viii. *Conidiospores* did not spread the disease from tree to tree to any great extent.

*Control of the Disease.*

i. The disease was effectively controlled on a property where it had been unusually serious for some years prior to these experiments.

ii. Ploughing in of over-wintered leaves early in the spring, *i.e.*, before the buds burst, was an important factor in the control of the disease.

iii. Bordeaux Mixture was more effective on both varieties used in these experiments, *i.e.*, Glou Morceaux and Beurre Bosc, as a spray to control "Black Spot" of pears than Lime Sulphur, because it retained its protective qualities over a much longer period than did the Lime Sulphur.

iv. Four sprayings with Bordeaux Mixture, applied at the "green-tip" (5-4-50), "pre-pink" to "pink," "petal-fall," and "10 days later" stages (all 3-4-50), gave very good control of "Black Spot." (79 per cent. perfect Glou Morceaux fruit; 89.5 per cent. marketable.)

v. A spraying with Bordeaux Mixture (3-4-50) applied one month later improved the control. (89 per cent. perfect Glou Morceaux fruit; 93 per cent. marketable.)

vi. One spraying with Bordeaux Mixture in the early "pre-pink" stage had some effect in controlling the disease, even when the ground was not ploughed early.

vii. An autumn spraying did not appear to contribute to the control of the disease in these experiments, in which the trees were heavily infected at the time of the application.

viii. The cost of material for four applications of Bordeaux Mixture was 3.56 pence per tree.

## REFERENCES CONSULTED.

Aderhold, R.—"Die Fusicladien unser obstbaume." Landw. Jahrl. Vol. 25, pp. 875-914. 1896.

Cunningham, G. H.—New Zealand Dept. of Agric. Bulletin 100. 1925.

Curtis, K. M.—New Zealand Journal of Agriculture, Vol. 23, pp. 215-218. 1922.

Duggar, B. M.—Cornell University Expt. Station, Bul. 145. 1898.

Lindau, G.—in Engler u. Prantle, "Naturl. Pfanzen-familien," 1 Teil. 1 Abt. S. 431. 1897.

Nicholls, H. M.—Agric. and Stock Dept. Tasmania Bul. No. 48. 1913.

Pittman, H. A.—"Black Spot" or "Scab" of Apples and Pears in Western Australia, Journal of Dept. of Agric. W.A., pp. 241-263. June, 1930.

Putteril, V. A.—Dept. of Agriculture, Union of S. Africa Bul. No. 2. 1922.

Pettey, F. W.—Dept. of Agriculture, Union of S. Africa, Reprint No. 40. 1925.

Salmon, E. S., and Ware, W. M.—Gardiner's Chronical, May 10th. 1924.

Stevens, F. L.—"Plant Disease Fungi," p. 181. 1925.

## LIVE STOCK AND MEAT.

For the information of readers of this "Journal," the following particulars have been supplied by Messrs. Elder, Smith and Coy., Ltd., Perth:—

COMPARATIVE NUMBERS OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS FOR MONTHS OF MARCH, APRIL, AND MAY, 1933.

| — | MARCH | | | | | APRIL. | | | | MAY. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1. | 8. | 15. | 22. | 29. | 5. | 12. | 19. | 26. | 3. | 10. | 17. | 24. | 31. |
| Sheep... | 13,440 | 12,048 | 11,240 | 10,583 | 11,200 | 10,568 | 8,500 | 11,330 | 8,422 | 8,740 | 10,441 | 11,620 | 11,151 | 9 992 |
| Cattle... | 502 | 586 | 547 | 575 | 521 | 530 | 423 | 460 | *657 | 565 | 519 | 453 | 480 | 440 |
| Pigs ... | 1,185 | 1,666 | 1,347 | 1,477 | 1,570 | 1,744 | 1,263 | 1,804 | 2,194 | 1,904 | 1,673 | 1,179 | 1,429 | 1,319 |

* 140 Stores.

COMPARATIVE VALUES PER POUND.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mutton | 3¾d. | 3½d. | 3½d. | 3½d. | 3d. | 3d. | 3½d. | 3d. | 3d | 3¾d. | 3¾d. | 4¼d. | 4¼d. | 4¼d. |
| Beef ... | 6d. | 5¾d. | 6d. | 5¾d. | 5¾d. | 5¾d. | 5¾d. | 5¼d. | 5¼d. | 5¼d. | 5d. | 5d. | 5d. | 5¼d. |
| Pork ... | 5d. | 4¾d. | 4¾d. | 4¾d. | 5d. | 5d. | 5¼d. | 5¼d. | 4¾d. | 4¼d. | 4¼d. | 5d. | 5d. | 6d. |
| Bacon... | 4d. | 4d. | 4d. | 3¾d. | 3¾d. | 3¾d. | 3¾d. | 3¾d. | 3¼d. | 3¼d. | 3¼d. | 3¼d. | 3¾d. | 4d. |

## MARKET REPORT.

Messrs. H. J. Wigmore & Company, Limited, of Wellington Street, Perth, have supplied us with the following information regarding the chaff available for auction at the Perth Railway Yards for the period March to May, inclusive:—

*March.*—1,215 tons of chaff, f.a.q., to prime was making from £4 12s. 6d. to £4 15s.; f.a.q., from £4 7s. 6d. to £4 10s. per ton. Medium quality was selling at from £4 to £4 5s. Prime oaten chaff was finding buyers at from £4 to £4 5s., f.a.q., at around £3 17s. 6d. per ton.

*Oats.*—Fair supplies were arriving for auction to a good demand. Good heavy feeds were realising from 1s. 10d. to 1s. 11½d.; good feeds from 1s. 8d. to 1s. 9d. per bushel.

*Wheat.*—F.a.q. was selling at from 2s. 9d. to 2s. 10½d., second grade from 2s. 6d. to 2s. 8½d. per bushel.

*April.*—825 tons of chaff. F.a.q. to prime wheaten chaff was finding buyers at from £4 15s. to £4 17s. 6d.; f.a.q. at from £4 7s. 6d. to £4 12s. 6d. per ton. Mediums were realising from £4 to £4 5s. per ton. Prime oaten chaff was selling at £4 7s. 6d. to £4 10s.; f.a.q. from £3 17s. 6d. to £4 per ton.

*Oats.*—Good heavy feeds were changing hands at from 1s. 9d. to 1s. 10d.; good feeds from 1s. 7d. to 1s. 8d. per bushel.

*Wheat.*—F.a.q. was finding buyers at from 2s. 10½d. to 2s. 11½d.; second grade from 2s. 7d. to 2s. 9d. per bushel.

*May.*—550 tons of chaff. Owing to the short supplies available the market firmed slightly. F.a.q. to prime was selling at from £4 15s. to £5; f.a.q. at from £4 10s. to £4 12s. 6d.; medium quality was making from £4 5s. to £4 7s. 6d. per ton.

*Oats.*—Very few consignments were arriving for auction, and good heavy feeds sold at from 2s. to 2s. 3d.; good feeds from 1s. 9d. to 1s. 11d. per bushel.

*Wheat.*—F.a.q. was changing hands at from 3s. 2d. to 3s. 4½d.; second grade from 2s. 9d. to 3s. per bushel.

H. J. Wigmore & Company, Limited, hold auction sales in the Perth Railway Yards each morning for chaff, grain, and potatoes, and all consignments forwarded to their care receive their best and prompt attention. The highest market prices with prompt returns are guaranteed.

---

## PRODUCERS' MARKETS CO-OPERATIVE, LTD.

### REPORT OF SALES FOR THE QUARTER ENDED 31st MAY, 1933.

*Fruit.*—The Bartlett pear crop was exceptionally heavy this season and, with very little export of this variety, values were low both for lines direct from the orchard and also for fruit *ex* cool store.

Late Valencia oranges were being marketed at the commencement of this period under review, realising bigger values.

The opening values of the new season navels were firm, but with supplies coming freely from all districts towards the end of the period and weather conditions being unfavourable, the demand eased considerably.

Apples of good quality have been short, and, with the exception of a few sales when the market was over-supplied with inferior and reject fruit for export, a good demand was experienced, particularly well-coloured dessert fruit.

Tomatoes, notwithstanding the lateness of the season, were heavily supplied, and it was not until the end of the period that supplies eased and the market reached a higher tone.

Grapes were *heavily* supplied, the quality being good and the demand steady throughout.

A light crop of passion fruit had the effect of a shortage of this fruit to a keen demand.

*Eggs.*—Although supplies from the country districts decreased considerably during March, all metropolitan lines were heavily supplied and sold at values ranging from 8½d. to 1s. 1d. a dozen for standard hen, 8d. to 10½d. a dozen for hen, and 6½d. to 9d. a dozen for pullet eggs. The market had not recovered from the slump prices recorded towards the middle and end of February, caused by a sudden rise in values and increased production, as reported in our review for the quarter ending the 28th February.

Market values remained in the vicinity of those mentioned above until the 24th March, when supplies from the metropolitan as well as from the country districts showed a considerable decrease in quantities, and values advanced on all lines

approximately 3d. per dozen. Apparently the advent of cooler conditions affected egg production and increased egg consumption, with the result that on the 29th March values advanced a further 5d. a dozen, bringing values up to 1s. 6½d. to 1s. 7d. for standard hen, to 1s. 6½d. and 1s. 7d. for hen eggs, and to 1s. 5d. to 1s. 6½d. for pullet eggs, and all lines sold to good clearances at these prices for a little over a week. In the first week of April supplies again showed a slight decrease, and values advanced a further 2d. a dozen for standard and hen eggs, but the demand for pullet eggs eased and values could not be maintained. Country eggs were short supplied, and sold to a good demand at values approximately 4d. a dozen below those ruling for metropolitan lines.

With high prices ruling, buyers who had cool store egg contracts commenced drawing on their cool store quantities; consequently competition for the new-laid egg eased, and, in spite of it being Easter time, values receded. On the Wednesday following Easter the demand was weak and values receded to 1s. 5d., 1s. 4d., and 1s. 2d. for standard, hen and pullet eggs respectively. Towards the end of April and the first fortnight of May supplies were much lighter, the demand was keen, and values advanced.

Owing to the mild winter the egg production was better than had been anticipated, but the demand was equal to the supply and values remained firm at prices ranging from 1s. 8½d. to 1s. 10½d. a dozen for standard eggs, 1s. 6½d. to 1s. 10d. a dozen for hen eggs, and 1s. 4½d. to 1s. 7½d. a dozen for pullet eggs. Towards the middle of May the cool store eggs were being freely drawn upon *ex* the ice works, and storekeepers reported that the sale of the cool store egg had seriously affected the sale of the new-laid egg and that sales were slow at the prices ruling. As a result the demand eased, and values receded approximately 1d. per dozen on all lines.

Towards the end of May heavy rains and strong winds affected the fowls, and caused egg production to decrease and values to reach their highest level for the season. Standard, hen, and pullet eggs sold to a very keen demand with values firm at 1s. 11½d. to 2s. a dozen, 1s. 11d. to 2s. a dozen, and 1s. 11d. to 1s. 11½d. a dozen respectively.

*Poultry.*—Poultry during March was heavily supplied, with good inquiries for prime quality, which sold to a good demand. The quality throughout, with the exception of a few pens of cockerels and hens on each sale day, was not up to the requirements of the trade, and as a consequence did not realise the best values. The cockerels were either too old, half-grown, and not in the best of condition. Good cockerels realised up to 9s. a pair and good hens up to 7s. 6d. a pair. Muscovy ducks and drakes were slow of sale; prime birds realised fair values, but half-grown or aged birds were hard to quit at low values. Turkey hens and gobblers were in demand, but both the supplies and the quality did not come up to the requirements of hte trade. Good gobblers and hens realised up to 25s. a pair and 13s. a pair respectively.

In the first fortnight of April supplies were maintained, with values unaltered. Towards Easter supplies increased and sold to a good demand for prime quality; medium and light quality realised accordingly. On the Wednesday prior to Easter supplies were exceptionally heavy, and it is considered to have been the heaviest supply of all lines on any particular sale day, either at Easter or Christmas. The supplies were much heavier than the demand and values were affected. Prime quality realised moderate values, but medium and poor quality were hard to quit at low values.

After Easter supplies were much lighter, and prices returned to normal values. Towards the end of April and during May supplies were moderate, with prime cockerels scarce, and realising up to 8s. 6d. a pair. Staggy cockerels were heavily supplied, but were too old for trade requirements. Prime hens sold to 7s. 6d. a pair; Muscovy ducks and drakes were still slow of sale, although some prime drakes realised up to 11s. 6d. a pair. Prime gobblers and turkey hens were scarce, with good inquiries for same. White leghorns decreased in supplies and sold at improved values.

*Vegetables.*—Potatoes early in the period were feeling the effect of the low values obtained in previous weeks, but when stocks of metropolitan lines were becoming exhausted, values lifted considerably. Some new dug were also offered, and these had a brightening effect on the market also. Country lines were in better demand and values were on a payable basis. These values were maintained, and at present all lines are in good demand, values gradually firming for all prime lines. Second grade lines have also found a fair market. Prime sweet potatoes found a steady market for fair quality lines.

Pumpkin of right size and quality found a ready market during the quarter, but far too much inferior quality was marketed. These lines were hard to quit at satisfactory prices.

Swedes were short supplied, and a steady demand existed during the period. Cabbage values were at their peak during March and April, and usually during May values suffer a relapse, but owing to the late season values were well maintained. Growers experienced a good season.

Peas maintained a steady level throughout at satisfactory values.

Beans were scarce during March and early April, and high prices were recorded. New crops coming in during the latter part of April and early May caused values to ease, but were again good during the last half of May.

Cucumbers were plentiful and all prime lines in steady demand.

Marrows also maintained a steady value.

Rhubarb was heavily supplied during the whole period, but the bulk was of poor quality and values for all lines suffered in consequence.

Celery was always well supplied, and special lines were always in good demand.

Lettuce also was heavily supplied, and, while prime samples sold well, inferior grades were hard to quit.

White and brown onions early in the quarter were plentiful and values were low. During the latter part of the period, however, values firmed somewhat.

Cauliflowers were at their glut during the period, but supplies were not so plentiful this year as in other years, and values have been better in consequence. Bunch lines were heavily supplied for all sales, and values for beetroot and turnips at glut level. Parsnips and carrots maintained a steady level at satisfactory prices.

# METEOROLOGICAL INFORMATION.

| STATIONS. | TEMPERATURE. | | | | RAINFALL. | | TEMPERATURE. | | | | RAINFALL. | | TEMPERATURE. | | | | RAINFALL. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum. | | Minimum. | | | | Maximum. | | Minimum. | | | | Maximum. | | Minimum. | | | |
| | Mean. | Highest. | Mean. | Lowest. | For Month. | Aver-age. | Mean. | Highest. | Mean. | Lowest. | For Month. | Aver-age. | Mean. | Highest. | Mean. | Lowest. | For Month. | Aver-age. |
| | MARCH, 1933. | | | | | | APRIL, 1933. | | | | | | MAY 1933. | | | | | |
| | | | | | inches. | inches. | | | | | inches. | inches. | | | | | inches. | inches. |
| Chapman State Farm | 90·0 | 108·0 | 66·2 | 52·3 | ·93 | 1·63 | 86·0 | 97·8 | 56·1 | 43·5 | ·57 | ·48 | 73·8 | 88·7 | 52·4 | 43·8 | 3·91 | 2·47 |
| Geraldton ... ... | 83·8 | 103·2 | 66·3 | 55·0 | ·74 | 1·47 | 83·5 | 95·5 | 60·9 | 51·8 | ·12 | ·82 | 73·9 | 86·8 | 57·6 | 51·0 | 2·56 | 2·81 |
| Waleibing ... ... | 87·8 | 108·2 | 61·1 | 48·2 | ·17 | 1·78 | 82·2 | 95·0 | 54·0 | 44·0 | ·41 | ·81 | 69·3 | 86·0 | 49·4 | 41·0 | 3·31 | 2·63 |
| Perth ... ... | 81·3 | 100·5 | 61·7 | 49·6 | 1·15 | ·76 | 78·6 | 89·8 | 58·1 | 48·2 | ·80 | 1·70 | 69·2 | 87·1 | 52·7 | 44·9 | 4·67 | 5·12 |
| Kalamunda ... ... | 81·4 | 100·0 | 59·9 | 46·5 | ·98 | ·81 | 77·5 | 87·1 | 58·5 | 49·1 | 1·15 | 2·05 | 66·1 | 85·0 | 52·5 | 43·0 | 5·32 | 6·29 |
| Bunbury ... ... | 77·7 | 92·0 | 56·1 | 40·3 | ·37 | ·99 | 75·4 | 84·0 | 50·3 | 40·0 | 1·82 | 1·71 | 67·9 | 80·3 | 49·6 | 41·0 | 4·19 | 5·21 |
| Bridgetown ... ... | 82·0 | 97·0 | 51·2 | 36·8 | 1·08 | 1·04 | 77·3 | 88·5 | 47·3 | 34·8 | 1·39 | 1·72 | 66·8 | 85·0 | 44·5 | 32·0 | 3·20 | 4·66 |
| Albany ... ... | 71·8 | 91·6 | 57·6 | 48·0 | 1·94 | 1·53 | 69·8 | 84·8 | 54·1 | 40·6 | 4·00 | 2·75 | 65·6 | 82·6 | 51·2 | 41·0 | 5·93 | 5·01 |
| Merredin State Farm | 85·8 | 98·5 | 59·3 | 42·0 | ·14 | 1·05 | 79·7 | 95·7 | 52·1 | 40·2 | ·16 | ·93 | 68·1 | 82·8 | 46·4 | 32·0 | 1·60 | 1·61 |
| Northam ... ... | 86·3 | 105·4 | 66·0 | 48·1 | ·97 | ·72 | 82·8 | 95·2 | 53·0 | 44·0 | ·25 | ·83 | 70·3 | 96·8 | 47·8 | 38·5 | 5·22 | 2·25 |
| York ... ... | 84·7 | 103·0 | 58·7 | 47·0 | 1·25 | ·63 | 80·5 | 93·0 | 50·4 | 42·0 | ·45 | ·82 | 69·0 | 85·0 | 45·9 | 37·0 | 3·91 | 2·35 |
| Narrogin State Farm | 81·1 | 92·5 | 51·7 | 38·8 | ·50 | ·82 | 76·8 | 89·2 | 51·0 | 39·0 | 1·00 | 1·13 | 65·5 | 82·5 | 46·8 | 37·6 | 4·33 | 2·61 |
| Katanning ... ... | 80·0 | 92·1 | 54·7 | 44·7 | ·95 | ·95 | 75·7 | 90·0 | 50·6 | 40·3 | ·45 | 1·19 | 64·8 | 82·0 | 46·7 | 36·0 | 2·38 | 2·42 |
| Cape Leeuwin ... | 73·2 | 94·8 | 61·5 | 52·0 | ·85 | 1·20 | 73·7 | 86·2 | 60·4 | 50·0 | 2·50 | 2·26 | 68·3 | 82·5 | 57·6 | 47·0 | 4·58 | 5·86 |

WESTERN AUSTRALIA—DEPARTMENT OF AGRICULTURE

## LIST OF BULLETINS AVAILABLE FOR DISTRIBUTION.

No. 20.—*The Pruning of Fruit Trees.* J. F. Moody. Price 2s. 6d.
No. 38.—*Linseed or Flax and It's Cultivation.* Geo. L. Sutton.
No. 46.—*Fruit Packing and Marketing and Exporting of Fruit.* J. F. Moody and J. Ramage. Price 1s. 6d.
No. 49.—*The Feeding of Horses.* Professor Paterson and G. L. Sutton.
No. 57.—*Vermin Destruction.* A. Crawford.
No. 60.—*The Farmer's Clip.* J. J. Mahood.
No. 68.—*Flaying and Treatment of Hides.* R. E. Weir.
No. 74.—*Tobacco Cultivation.* A. R. C. Clifton.
No. 79.—*Sheep on the Wheat Farm and their Management in W.A.* H. McCallum.
No. 84.—*Tomato Culture in Western Australia.* E. T. Morgan.
No. 88.—*Light Land: Conference.* G. L. Sutton.
No. 90.—*Stock Waters: Standard for Composition of.* E. A. Mann.
No. 91.—*Dairy Premises.* P. G. Hampshire.
No. 93.—*The Home Tanning of Sheep and other Skins.* H. Salt.
No. 99.—*Australian White.* G. L. Sutton.
No. 101.—*Cotton Cultivation.* G. L. Sutton.
No. 103.—*Kerosene Method for Eradicating Zamia Palm.* G. K. Baron-Hay.
No. 105.—*Pedigree Selection of Seed.* G. L. Sutton.
No. 113.—*Picked Pieces: Classification of Clip.*
No. 114.—*Blue Mould on Citrus Fruits.* W. M. Carne.
No. 115.—*The Value of Windmills for Pumping Water in W.A.* A. H. Scott.
No. 116.—*Spotted Wilt of Tomatoes.* W. M. Carne.
No. 117.—*Cream.* P. G. Hampshire.
No. 119.—*Take-all and Similar Diseases of Wheat and How to Control Them.* H. A. Pittman.
No. 121.—*Mildew Septoria Leaf Spots and Similar Diseases of Cereals.* W. M. Carne.
No. 124.—*Government Inspection of Wheat.* G. K. Baron-Hay.
No. 125.—*Buy Good Seed—Advice to Farmers.* W. M. Carne.
No. 126.—*The Rusts of Cereals.* W. M. Carne.
No. 128.—*Woolly Aphis Parasite.* L. J. Newman.
No. 131.—*The Strength of Wheat and Flour and Its Determination.* R. G. Lapsley.
No. 135.—*The Objects and Conditions of Farmers' Trials.* Geo. L. Sutton.
No. 136.—*The Use of the Scythe.* H. Campbell.
No. 137.—*Fruit Fly—A Further Series of Trapping or Luring Experiments.* L. J. Newman and B. A. O'Connor.
No. 138.—*Clearing Heavily Timbered Areas for Pasture in the South-West.* A. B. Adams.
No. 140.—*Surface Drainage with The Martin Ditcher.* A. R. C. Clifton.
No. 141.—*Breeding a Permanent Flock.* Hugh McCallum.
No. 142.—*The Plague Locust.* L. J. Newman.
No. 143.—*The Zamia Palm and Rickets in Cattle and The Kerosene Method for Eradicating the Palm.* A. B. Adams and G. K. Baron-Hay.
No. 147.—*Cultivation of the Potato in Western Australia.* G. N. Lowe.
No. 149.—*Lucerne.* G. L. Sutton.
No. 150.—*Subterranean Clover.* A. B. Adams.
No. 152.—*Bee Diseases.* H. Willoughby-Lance.
No. 153.—*Eradication of Lice and Tick in Sheep.* A. McK. Clark.
No. 154.—*Branding the Wool Bale.* G. L. Sutton and N. Davenport.
No. 156.—*Forest Pests—The Pin Hole Borer.* J. Clark.
No. 157.—*Cluster Clover.* W. M. Carne, C. A. Gardner, and A. B. Adams.
No. 158.—*Thorn Apple.* W. M. Carne and C. A. Gardner.
No. 159.—*Bathurst Burr.* W. M. Carne and C. A. Gardner.
No. 160.—*Cereal Smuts.* W. M. Carne.
No. 161.—*Tuberculosis in Dairy Cattle.* F. Murray-Jones.
No. 164.—*The Development of a Dairy Herd.* P. G. Hampshire.
No. 166.—*Trefoil of Burr Trefoil.* W. M. Carne, C. A. Gardner, and A. B. Adams.
No. 169.—*Forest Insects—The Marri Borer.* J. Clark.
No. 170.—*Paterson Curse.* W. M. Carne and C. A. Gardner.
No. 171.—*Cockspur Thistle.* W. M. Carne and C. A. Gardner.
No. 172.—*The Annual Birdsfoot Trefoils.* W. M. Carne, C. A. Gardner, and A. B. Adams.
No. 173.—*Braxy-like Disease of Sheep in Western Australia.* W. H. Bennetts.
No. 175.—*Black Spot or Blossom-end Rot of Tomatoes.* W. M. Carne.
No. 176.—*Exanthema of Citrus.* H. A. Pittman, B.S.Agr., Plant Pathologist.

No. 177.—*Lotus Major.*
No. 178.—*Star Thistle.* W. M. Carne, F.L.S. and C. A. Gardner.
No. 181.—*Branding of Stock.* A. Arnold, Registrar of Brands.
No. 182.—*Bulls and Butter.* P. G. Hampshire, H.C.D.
No. 183.—*Apple of Sodom.* W. M. Carne and C. A. Gardner.
No. 184.—*Pastures—How Phosphatic Manures Improve Composition of Fodders.* G. K. Baron-Hay, B.Sc.Agr., Dairy Adviser.
No. 185.—*Black Spot of Anthracnose of the Grape Vine.* W. M. Carne.
No. 186.—*Strawberry Clover.* W. M. Carne, F.L.S., C. A. Gardner, and A. B. Adams.
No. 187.—*Diseases of Farm Animals and their Treatment.* A. McK. Clark, L.V.Sc., Chief Veterinary Surgeon.
No. 188.—*The F.A.Q. Wheat Standard.* Geo. L. Sutton, Director of Agriculture.
No. 189.—*Trapping Blowflies,* L. J. Newman, F.E.S., Entomologist, and J. Clark, Assistant Entomologist.
No. 192.—*Root Rot of Fruit Trees due to Armillaria Millea.* W. M. Carne.
No. 192a.—*Root Rot.* A. J. Despeissis.
No. 193.—*Broom Millet.* G. K. Baron-Hay, B.Sc.Agr.
No. 196.—*Earcockle and a Bacterial Disease of Wheat.*
No. 197.—*Leaf Curl of Peach and Nectarine.* H. A. Pittman, B.Sc.Agr., Plant Pathologist.
No. 198.—*Spotted Thistle.* W. M. Carne, F.L.S. and C. A. Gardner.
No. 199.—*Codlin Moth.* L. J. Newman, F.E.S., Entomologist.
No. 200.—*The Registration of Bulls under The Dairy Cattle Improvement Act,* 1922.
No. 203.—*Geraldton Carnation Weed,* W. M. Carne, F.L.S. and C. A. Gardner.
No. 204.—*Paspalum Dilatatum.* W. M. Carne, F.L.S. and F. A. Gardner.
No. 208.—*Pastures—Old and New.* P. G. Hampshire.
No. 211.—*Silage—Ensilage and Silos.* Geo. L. Sutton, Director of Agriculture.
No. 213.—*Stinkwort.* W. M. Carne, F.L.S., and C. A. Gardner.
No. 214.—*Mosaic and Leaf Roll of Potatoes.* W. M. Carne, F.L.S.
No. 215.—*King Island Melilot.* W. M. Carne, C. A. Gardner, and A. B. Adams.
No. 216.—*Summer Fodder Crop Competitions.* P. G. Hampshire.
No. 217.—*Army Worms, Cut Worms and Web Worms.* L. J. Newman, F.E.S.
No. .—*Herd Production Recording.* P. G. Hampshire, Superintendent of Dairying, and P. C. Cousins, Senior Herd Recorder.
No. 219.—*Bitter Pit in Apples.* W. M. Carne, F.L.S.
No. 220.—*Irrigation and Drainage.* A. H. Scott.
No. 222.—*Spring Beetle Investigation.* L. J. Newman.
No. 223.—*Pink Eye or Ophthalmia in Sheep.* A. McK. Clark.
No. 225.—*Subterranean Clover.* C. A. Gardner and T. C. Dunne.
No. 226.—*Cape Tulip.* W. M. Carne, and C. A. Gardner.
No. 227.—*Grey Speck Disease of Wheat and Oats.* W. M. Carne.
No. 228.—*Root Rot and Foot Rot of Wheat.* W. M. Carne.
No. 229.—*Feeding Tests with Western Australian Poison Plants.* H. W. Bennetts.
No. 230.—*Bone Chewing and Tonic Paralysis of Cattle.* H. W. Bennetts.
No. 231.—*Grain Weevils.* L. J. Newman.
No. 234.—*Cotton Bush.* W. M. Carne and C. A. Gardner.
No. 235.—*Bacon Curing.*
No. 238.—*The First Australian Studmaster and His Flock.* Geo. L. Sutton.
No. 241.—*Field Experiments, Merredin.* Langfield (Reprint from "Journal.")
No. 242.—*Field Experiments, Avondale.* Wild and Bailey. (Reprint from "Journal.")
No. 243.—*Successful Codlin Moth Control in W A.* G. W. Wickens. (Reprint from "Journal.")
No. 245.—*Leaf Rust of Stone Fruit.* W. M. Carne. (Reprint from "Journal.")
No. 246.—*Field Experiments—Wongan Farm* I. Thomas. (Reprint from "Journal.")
No. 250.—*Sheep—Hand-feeding.* H. McCallum. (Reprint from "Journal.")
No. 251.—*Rutherglen Bug.* J. L. Newman. (Reprint from "Journal.")
No. 252.—*Worms affecting Sheep.* H. W. Bennetts. (Reprint from "Journal.")
No. 253.—*Drooping Flowered Clover.* T. C. Dunne and C. A. Gardner.
No. 254.—*Sorrel.* W. M. Carne, A. B. Adams, and C. A. Gardner. (Reprint from "Journal."
No. 256.—*Climbing Cut-worm or Tomato Moth.* L. J. Newman. (Reprint from "Journal.")
No. 258.—*Pasture Development in the Great Southern Area.* J. T. Armstrong, B.Sc. (Reprint from "Journal.")
No. 260.—*The Treatment of Bowling Greens, Tennis Courts and Lawns.* G. N. Lowe. (Reprint from "Journal.")
No. 261.—*Rose Chief of Wollongbar—The value of "Breeding."* P. G. Hampshire. (Reprint from "Journal.")
No. 262.—*The Blow-fly Menace.* H. McCallum. (Reprint from "Journal.")
No. 263.—*Dairy Farm Competition, Harvey District.* G. K. Baron-Hay. (Reprint from "Journal.")
No. 264.—*Alsike Clover.* C. A. Gardner. (Reprint from "Journal.")
No. 265.—*Blue Lupin.* G. L. Sutton. (Reprint from "Journal.")

No. 266.—*The Blackberry Pest.* G. L. Sutton. (Reprint from "Journal.")
No. 267.—*Royal Agricultural Society Crop Competitions.* I. Thomas. (Reprint from "Journal.")
No. 268.—*Soil Alkali.* L. J. H. Teakle (Reprint from "Journal.")
No. 270.—*Subterranean Clover Weevil.* L. J. Newman. (Reprint from "Journal.")
No. 271.—*Seaweed as a Fertiliser.* L. J. H. Teakle and L. J. Newman. (Reprint from "Journal.")
No. 272.—*Biological Control of the Silver-Eye.* L. J. Newman. (Reprint from Journal.")
No. 273.—*Subterranean Clover Seed and its Impurities, with a Comparison between Machine-Cleaned Seed and Seed in the Burr.* H. G. Elliott. (Reprint from "Journal.")
No. 274.—*Nut Grass.* C. A. Gardner. (Reprint from "Journal.")
No. 276.—*Minerals in Pastures and their relation to Animal Nutrition.* J. B. Orr. Reprinted from "Journal.")
No. 277.—*The Potato Plot.* G. N. Lowe. (Reprint from "Journal.")
No. 278.—*Pear Scab.* G. W. Wickens. (Reprint from "Journal.")
No. 279.—*Curculio Beetle.* A. Flintoff. (Reprint from "Journal.")
No. 280.—*Fruit Thinning.* G. W. Wickens. (Reprint from "Journal.")
No. 281.—*The Need for Lime in Western Australian Agriculture.* Geo. L. Sutton. (Reprint from Journal.")
No. 282.—*The Cost of Feeding Pure Bred Cows under the Australian Official Herd Recording Scheme.* P. G. Hampshire and P. C. Cousins. (Reprint from "Journal.")
No. 283.—*The Eelworm-Gall or Root-Knot Disease.* H. A. Pittman. (Reprint from "Journal.")
No. 284.—*The Common Blue Lupin.* C. A. Gardner and H. G. Elliott. (Reprint from "Journal.")
No. 285.—*Potato Diseases in Western Australia.* H. A. Pittman. (Reprint from "Journal.")
No. 286.—*Honey.* H. Willoughby Lance.
No. 287.—*Variation in the Weight of Eggs.* W. T. Richardson, Poultry Adviser.
No. 288.—*Pastures. In Areas of Medium Rainfall.* G. K. Baron-Hay, Assistant Superintendent of Dairying.
No. 289.—*The Unsound Economics of the F.A.Q. Standard for Selling Australian Wheat.* Geo. L. Sutton.
No. 290.—*Wax Scale* (*Ceroplastes Ceriferus*), Anderson. L. J. Newman, F.E.S., Entomologist; B. A. O'Connor, B.Sc. Agr., Agricultural Adviser; and H. G. Andrewartha, B.Sc.Agr., Agricultural Adviser.
No. 291.—"*Early Blight*" or "*Leaf Spot*" *and the Macrosporium* "*Storage Disease*" *of Potatoes.* H. A. Pittman, B.Sc.Agr., Plant Pathologist.
No. 292.—*Cultivation of Onions.* E. T. Morgan, Vegetable Inspector.
No. 294.—*Best Kept Farm Competition—Manjimup.* M. Cullity.
No. 297.—*Notes on Cultivation on the Tangier Pea.* G. K. Baron-Hay.
No. 298.—*Seed Testing—Value of.* H. G. Elliott
No. 299.—*Blowfly Parasite.* C. Newman and H. G. Andrewartha.
No. 300.—*Egg Export—Rejects, their Cause and Remedy.* W. T. Richardson.
No. 301.—*Wheat Heads—Parasite and other causes of Emptiness, Take-All, Root Rot, and Foot Rot.* H. A. Pittman.
No. 302.—*Hints on Bees and Their Management.* H. Willoughby Lance.
No. 303.—*Fallowing for Fertility.* Dr. Teakle and G. H. Burvill.
No. 304.—*The Standard Egg.* W. T. Richardson.
No. 305.—*Potato Certification Scheme.* H. A. Pittman and H. G. Elliott.
No. 306.—*Black Spot or Scab of Apples and Pears.* H. A. Pittman and H. G. Elliott.
No. 307.—*Present Comparative Value of Feeding Stuffs.* G. K. Baron-Hay.
No. 308.—*Bee Hives.* H. Willoughby Lance.
No. 309.—*The Pollination of Orchards.* H. Willoughby Lance.
No. 310.—*The Wild Turnip.* C. A. Gardner.
No. 311.—*Care in Crutching Sheep.* H. McCallum.
No. 312.—*Selecting the Breeding Ewe.* H. McCallum.
No. 313.—*Lumpy or Matted Wool in Sheep.* J. F. Filmer.
No. 314.—*Bordeaux Mixture.* H. A. Pittman.
No. 315.—*Mexican Poppy.* C. A. Gardner.
No. 316.—*Bananas.* F. J. S. Wise.
No. 317.—*Blowflies in South-West—Seasonal Influence.* Newman, O'Connor and Andrewartha.
No. 318.—*Bees Act.* H. Willoughby Lance
No. 319.—*Cape Gooseberry.* G. W. Wickens.
No. 320.—*Agricultural Seeds and Their Weed Impurities.* H. G. Elliott.
No. 321.—*Cooling of Milk and Cream.* G. K. Baron-Hay.
No. 322.—*Feeding Wheat to Pigs.* G. K. Baron-Hay.
No. 323.—*Nitrogen Fixing Bacteria for Leguminous Plants.* H. A. Pittman.
No. 324.—*Seed Testing for Farmers. etc.* H. A. Pittman.
No. 325.—*Apple Curculio.* H. G. Andrewartha.
No. 326.—*Flag Smut of Wheat—Variety Tests.* E. J. Limbourne.

No. 327.—*Wine-Making for Domestic Use.* H. K. Johns.
No. 328.—*Soil Alkali—Procedure for Estimation.* Dr. Teakle and L. W. Samuel.
No. 329.—*Tobacco—Downy Mildew, or Blue Mould.* H. A Pittman.
No. 330.—*Chemical Weed Killers.* G. R. W. Meadley and H. G. Elliott.
No. 331.—*Carniolan Bees.* H. Willoughby Lance.
No. 332.—*Cool Dairies for Cream.* M. Cullity.
No. 333.—*The Centrifugal Cream.* G. K. Baron-Hay.
No. 334.—*Sugar Beet and Its Cultivation.* G. L. Sutton.
No. 336.—*Seed and Seed-Bed Disinfection.* H. A. Pittman.
No. 337.—*The Principal Insect Pests of Tobacco.* L. J. Newman.
No. 338.—*The Cleansing of Dairy Utensils.* G. K. Baron-Hay.
No. 339.—*The Apple Tree and Its Food.*—Geo. L. Sutton.
No. 340.—*Standardising the Apple Pack.* A. Flintoff.
No. 341.—*Dentitions of Sheep.* H. McCallum.
No. 342.—*Cream Cheese.* G. K. Baron-Hay.
No. 343.—*The Apple Curculio.* H. G. Andrewartha.
No. 344.—*Oats Variety Trials, Denmark,* 1931. G. Gauntlett.
No. 345.—*Pasture Renovation.* C. Giles and H. K. Gibsone.
No. 346.—*Relative Food Values.* G. K. Baron-Hay and L. C. Snook.
No. 347.—*North Drakesbrook Experimental Plots.* C. Giles.
No. 348.—*Bacterial Blight of Beans.* H. A. Pittman.
No. 349.—*The Cost of Feeding Pure-bred Cows under The Australian Official Herd Recording Scheme, Western Australia,* 1930-31.
No. 350.—*Turkeys in Western Australia.* A. C. Jenyns.
No. 351.—*Experiments with Rhenania Phosphate in Western Australia.* L. J. H. Teakle, G. K. Baron-Hay, and I. Thomas.
No. 352.—*The Sowing of Pasture Seeds.* G. K. Baron-Hay.
No. 353.—*The Canary Grasses of Western Australia.* C. A. Gardner and G. R. Meadley.
No. 354.—*Brown Rot of Citrus.* H. A. Pittman.
No. 355.—*Better Dairying Competitions.* G. K. Baron-Hay.
No. 356.—*Minerals in Animal Nutrition.* J. F. Filmer.
No. 357.—*The Pea Weevil.* L. J. Newman.
No. 358.—*Clover Springtail Lucerne Flea Investigation.* L. J. Newman.

---

The following publications may be obtained from the Department of Agriculture, Perth, on application, or will be sent post free to any address in this State on receipt of a remittance for the amount stated:—

*The Management of Poultry under Western Australian Conditions,* by W. T. Richardson, Poultry Adviser.

This is a most useful and valuable book, not only for beginners, but to all those who keep fowls for pleasure and profit. It deals fully with all matters connected with the industry, including Breeding, Feeding (for stock birds or egg production), Incubating, Brooding and Care of Chicks, Marketing (eggs and poultry), and all matters of use to the poultry-keeper. It also fully describes symptoms of various ailments and diseases and simple treatment for same, and, as the book was written to suit *local conditions,* every poultry-keeper should have a copy by him. Price, 2s.

*The Pruning of Fruit Trees,* by J. F. Moody, Fruit Industries Commissioner:

This publication contains numerous illustrations, being reproduction of photographs taken in this State, of pruned and unpruned trees, which make the details set out in the letterpress particularly easy to understand. Price 2s. 6d.

*Fruit Packing and the Marketing and Exporting of Fruit,* by J. F. Moody, Fruit Industries Commissioner, and J. Ramage, Packing Instructor:

This publication contains invaluable information on packing and grading fruit for local and export markets. It is freely illustrated, and no fruit-packing shed should be without a copy. Price 1s. 6d.

*THIS JOURNAL goes direct to more Primary Producers than any other publication in this State. Therefore, if you have anything to sell to the Pastoralist, Wheat-grower, Dairy-farmer, Orchardist, Potato-grower, let him hear of it through this Journal.*

*For advertising rates, etc., write to*

*THE ADVERTISING AGENT, CENTRAL RAILWAY STATION, PERTH.*

*When writing to Advertisers, say you saw their ad. in this Journal.*

## Index to Advertisements.


| | Page |
|---|---|
| Agricultural Bank ... ... ... ... | iii. |
| Bank of New South Wales and West Australian Bank ... ... Inside Front | Cover |
| Cooper's Alboleum ... ... ... ... | viii. |
| Cuming Smith & Mt. Lyell Farmers' Fertilisers, Ltd. ... ... ... ... | xii. |
| Elder, Smith & Co., Ltd. ... ... | vi |
| Goldsbrough, Mort & Co., Ltd. ... ... | i. |
| McKay, Massey-Harris Pty., Ltd. ... | iv. |
| Millar's Timber & Trading Co., Ltd. ... | ii. |
| National Egg (W.A.), Ltd. ... ... | v. |
| "Nature in Farming," Text Book Inside Back | Cover |
| Nitrogen Fertilisers, Ltd. ... ... ... | xiv. |
| Plaistowe & Co., Ltd. ... ... ... | x. |
| Queensland Forests, Ltd. ... ... ... | v. |
| Railway Advertising Agent ... ... | 326 |
| Tillys, Ltd.—Pharmacy ... ... ... | v. |
| Trewhella Bros.—Grubbing Implements... | xi. |
| Westralian Farmers, Ltd. ... Outside Back | Cover |
| Wilson & Johns, Ltd., Seedsmen ... ... | xiii. |

Please mention the *Journal of Agriculture, W.A.*, when writing to advertisers.